The Engineering and Mining Journal

VOLUME 96 AUGUST 30, 1913 NUMBER 9

The Argo Cyanide Mill, Idaho Springs, Colo.

By Stephen L. Goodale*

SYNOPSIS—Description of a recently-constructed custom mill at the mouth of the Newhouse tunnel. Different ores are received in separate bins and mixed as desired for milling. Concentration, amalgamation and cyanidation is the combination process employed. Stamps are used for crushing in cyanide solution. Counter-current decantation is practiced for slime washing.

Situated near the mouth of the Argo, better known as the Newhouse, tunnel, is the Argo mill, which was put into commission early this year. It is still undergoing minor changes such as are usually made in a new plant as improvement ideas occur to those in charge. The plan of treatment was worked out at the Hudson mill by the present management, and in building the Argo mill, certain defects of the earlier one were overcome. An important improvement is the gravity handling of pulp and consequent elimination of elevators, necessary at the Hudson because of its situation on nearly level ground.

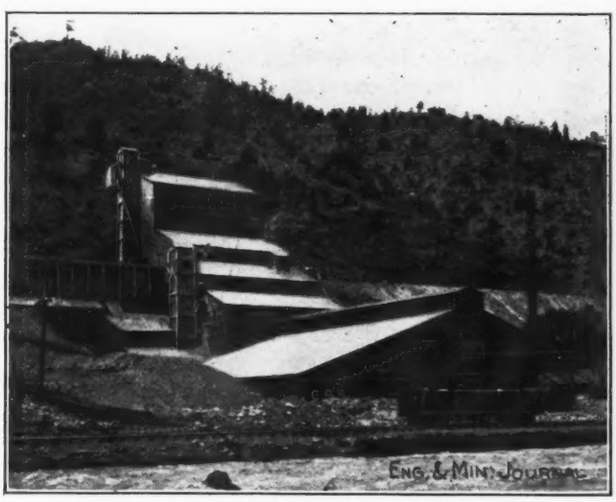

Fig. 1. View of Argo Mill from across Clear Creek

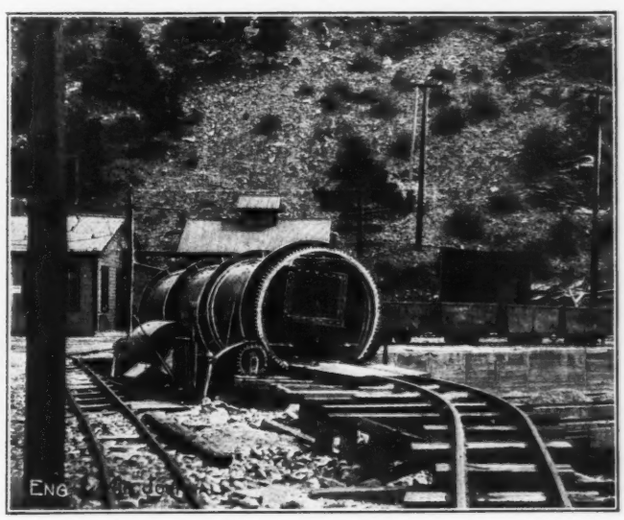

Fig. 2. Ore Distributor and Tipple at Argo Mill.

A Steel-Frame Building on Dump Ground

The mill is housed in a steel-frame building covered with corrugated iron. It is built on a steep piece of made ground at the edge of the tunnel dump. Four terraces or principal floor levels in the mill are the upper, or battery and amalgamating floor; the second, Card concentrator floor; third, tube-mill level; and fourth, that containing the six slime-treatment tanks, concentrate bins, boiler, compressor, zinc boxes, etc. The sampler is entirely separate from the other parts of the mill.

As the building is on dump-made ground, it was necessary to carry all foundations to an unusually great depth to rest them on bed rock. Battery pillars are over 20 ft. deep and have an open passage or channel through the center into which the holding-down bolts of the foundation extend. Below this they unite into one solid reinforced-concrete pillar reaching under the length of the four batteries to bedrock. The pillars for the tube mill also extend to bedrock, and it has recently become necessary to extend those for the head thickener tank to bedrock also, because settling has been sufficient to throw the tank out of level. Other foundations have been taken well below the original surface into good gravel but not to bedrock. Three reinforced-concrete retaining walls support the upper terraces and these are now being more strongly buttressed.

The building is to be heated by radiation from the vats, solution piping, etc., and since the mill solutions must be kept at a temperature of 70° F. or more for the success of the process, it is hoped that this source of heat will be sufficient, although radiators will probably be

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required in parts of the sampler. Steam coils are placed in the vats and the end of the steam line is open into the vat which is taking water wash. Steam for this purpose is generated in one of the old Newhouse-tunnel boilers, erected on the lower floor of the mill. The presence of the boiler will doubtless aid in heating.

Ore Is Mechanically Sampled

The sampler is to the left of the mine, Fig. 1, and the main-treatment thickener tanks are in the lower wing of the mill nearest the creek. Ore for treatment comes from the tunnel and is trammed by motor, three cars at a time, into the tipple, which is then brought over the proper bin and the three cars overturned, held fast in

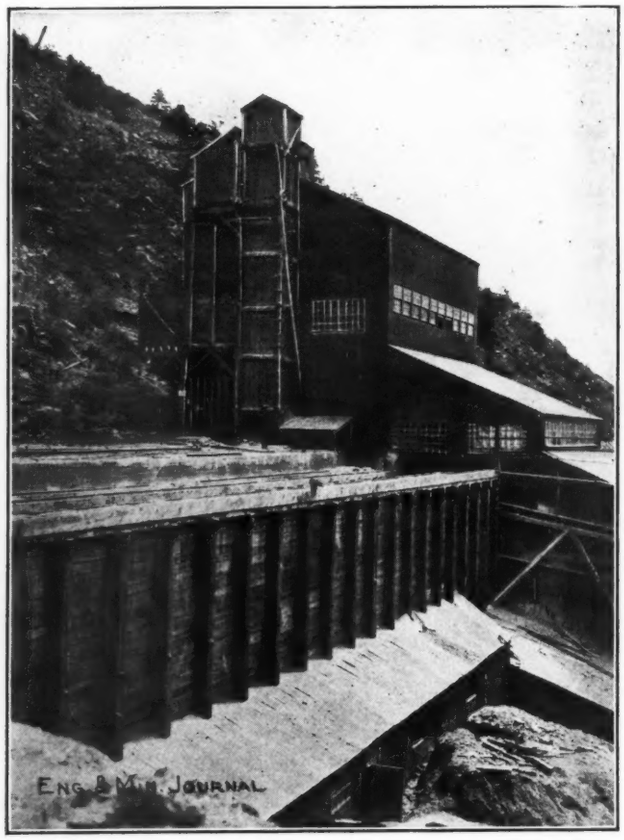


Fig. 3. Ore Bins and Upper Part of Argo Mill

the tipple cylinder meanwhile. An incline track has been installed connecting the Colorado & Southern Ry. siding with the top of the tunnel dump, so that ore may be handled cheaply from railroad cars and to the receiving bins. Regular tunnel cars are used for this transfer and are pulled to the top of the dump by a small electric hoist and moved from there to the bins by a motor. Twenty-two separate bins are served by this distributing device. They are not enclosed, but will be later as protection from rain and snow. A steel-pan conveyor takes the ore from any one or combination of bins and delivers it to the gyratory crusher in the sampling plant.

A sampling plant in connection with a mill is an innovation in the district. The purchase of ore on the basis of careful sampling is a necessity with this type of mill because great value is locked up in process of treatment. With the simpler amalgamating and concentrating mills it is possible to treat each lot separately, milling for the account of the owner without purchasing it outright. Even with these simpler mills it is probable that sampling would give results more satisfactory. The treatment schedule reproduced herewith shows the present basis for the purchase of ores.

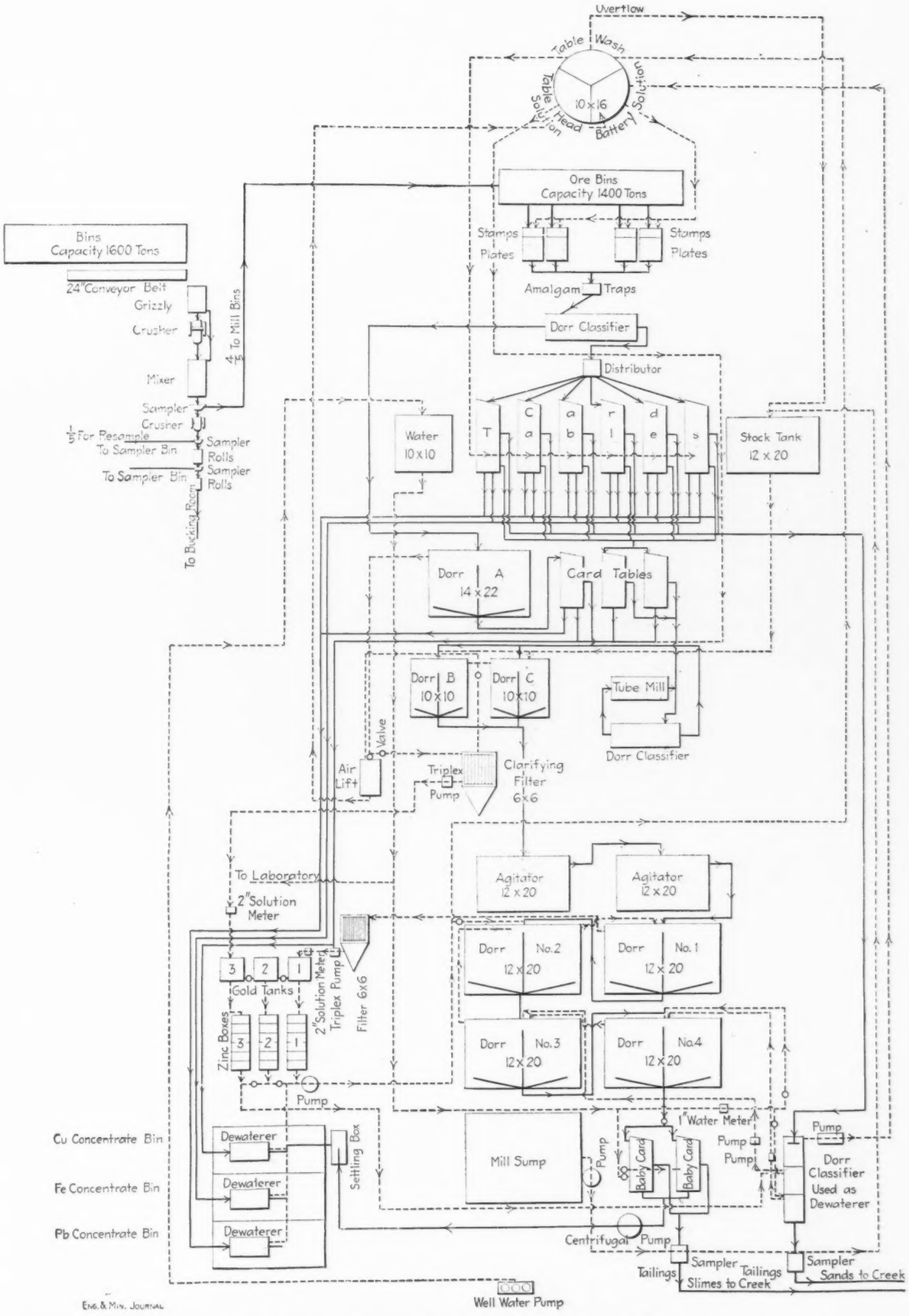
The practice in sampling is to take a 20% cut of the ore which has been crushed in the gyratory to pass a 1½ in. ring, sending the 80% to the mill. The 20% portion is then crushed by rolls, and a second 20% cut taken, the 80% portion here being reserved until after settlement for the lot has been made with the shipper, when it is sent to the mill. A third 20% cut is taken, the 80% portion going to the mill. The final sample, 1/125 of the original lot, is finished by hand and four assay samples made up as usual.

Ore sent to the mill is elevated and conveyed to a single 1400-ton flat-bottom bin at the top of the mill. It is distributed throughout the bin, the full width of the mill, by an automatic traveling-belt tripper. No belt elevators or conveyors are used in any part of the plant except those used to raise the sampled ore to the top of the mill.

Gravity Stamps Followed by Amalgamation

There are twenty 1000-pound, high-speed, short-drop stamps, arranged in two sets of 10, each driven by a three-phase, constant-speed motor which is geared to the shaft which carries the pinion for the main-belt drive. This gearing was made too light and the teeth have been stripped, but heavier gears are to be installed. The usual arrangement of bin gates with suspended Challenge feeders has been adopted. The mortars have an extra large base, 42 in. wide by 58 in. long, and are set on a thin lead plate directly on the concrete. Eight 1¾-in. holding-down bolts are used for each mortar. Most of the ores likely to be milled are easily crushed and slime readily, and stamp duty is consequently high. About 135 tons per day is crushed by the twenty stamps when using a 12-mesh battery screen and a 4-in. discharge. All crushing is done in cyanide solution. All solution flows to the stamps through a barrel placed in front of each battery. Lime may be conveniently added in the barrels when required.

The amalgamating plates, following the usual practice in the district, are only 5 ft. long. Longer plates would make a higher saving, but this added amount was found by experiments made with longer plates at the Hudson mill to cost more than it would be worth because of the great difficulty of keeping long plates in good order when crushing in cyanide solution. Each plate discharges into an amalgam trap, all four of which are placed in one 4x4-ft. wooden tank, which discharges through a central bottom pipe to the Dorr classifier. These amalgam traps are electrolytic and constitute one of the particularly interesting features of the mill. They consist of a lower cone 12 in. in diameter and 12 in. deep, holding a copper plate floating on a bath of mercury. The pulp is discharged through a 2-in. pipe, 3 in. above the cone plate and insulated from the lower cone, though rigidly fastened to it. This pipe is enlarged above to 6 in. and is connected to the positive side of a direct-current circuit, the copper plate in the cone below forming the cathode. The 6-volt current for this use is made by a 4-kw. generator placed on the second terrace just below



FLOW SHEET OF ARGO MILL, IDAHO SPRINGS, COLO.

the traps to secure short leads. The installation of this efficient device, which gave good enough results at the Hudson mill to justify its adoption here, is doubtless an ample corrective for the rather short apron plates.

Dorr Classifiers Separate Sand for Concentration

The pulp from the traps is separated by a duplex Dorr classifier into sand and slime, the term slime throughout this paper being used to indicate not only the colloid but also the fine granular sand which accompanies it. The sand flows through a simple cone distributor to five Card concentrators, the placing of which is an admirable example of efficient space utilization, a point which doubtless originated in a study of the Hudson mill, the only one where the writer has seen such close placing of concentrating tables. So close are they set to each other that only the ends, and not the sides, are easily accessible. By fitting the tables so closely it was possible to get them on the most convenient level, and it is still possible to conveniently make the occasional adjustments necessary.

Four Concentration Products Made

These tables make four products; a lead concentrate and an iron concentrate, which pass through small Dorr classifiers and proceed to their respective bins, a middling, which is reconcentrated on another Card concentrator on the terrace next lower down and a final tailing which passes to a three-unit Dorr classifier, where it is dewatered and washed, first with barren solution and then with water, and then run to the creek. The sand tailing carries only 50 to 70c. per ton in both silver and gold, but it is possible that it may be treated in the near future by amalgamation to recover gold that has been brightened by the cyanide without having been in contact long enough for complete solution. Such treatment is successful with ores carrying coarse, rusty gold as some of the Gilpin and Clear Creek County ores do. The treatment is similar to that applied to the Annie Laurie ore in southern Utah some years ago.

Concentrate from the middling table is sent to the copper-shipping bin. Tailing from this table unites with the spitzkasten underflow, and the combined material goes to a small classifier. The slime from it goes to two 10-ft. agitators and the sand to a 3x10-ft. tube mill. The tube-mill discharge is returned to the classifier. The single-compartment spitzkasten which receives the slime overflow of the first classifier, will in future deliver its underflow to a Card concentrator instead of to the tube mill as is now done.

In the original plan of the mill it was designed to concentrate the underflow from the 14x22-ft. thickener on two Card concentrators, but trouble was experienced in feeding the tables from that source, the pipes frequently stopping up, and feeding irregularly. The spitzkasten has been installed to divert the heaviest of the material, as otherwise it would not be caught until reaching the lower end of the mill, and would thus be subject to the action of the cyanide solution a long time.

Agitation both Mechanical and Air

Overflow from the head thickener is pumped to the top of the mill by a triplex plunger pump, to which can be led also the overflow of the two 10-ft. agitators which take the tube-mill product. The pipe connections here are such that if desired the overflow of the agitators and thickener can be sent direct to a precipitation box, and this would doubtless be done with certain ores, then supplying battery solution from a lower-grade source. The underflow from the head thickener, together with the underflow of the two 10-ft. agitators, goes to the two 12x20-ft. agitators, and constitutes the feed for the large treatment tanks. The agitation is accomplished mainly by compressed-air lifts, although mechanical stirrers are also used in three of the agitators. Five air lifts are used in the 12x20-ft. vat, which has no mechanical stirrer. Air is furnished for these agitators by a 14x8-in. compressor run at 200 r.p.m., and an old fire-tube boiler is used for an air reservoir. Careful technical control and thorough previous experimenting are indications that the Argo mill is likely to continue operations for a long time, and will not join the ranks of the "monuments" so plentiful hereabout.

Counter-Current Slime Washing

Four 12x20-ft. Dorr thickeners follow the agitator tanks, and are arranged three in series for the main slime treatment, and one on settler service for various slime overflows from the lower part of the mill. The counter-current principle is applied in treating the pulp on its way through these tanks. In detail, the flow is as shown in the accompanying flow sheet. The concentrate from the two Card tables carries sufficient copper to be classed as a copper product and is delivered through a dewatering classifier to the copper bin for shipment. Tank 4 is set 68 in. higher than tank 1, and the intermediate ones are set at intermediate levels so that the solution may run back by gravity. The overflow of tank 1 flows to a clarifying leaf-filter, whence it is drawn to the zinc boxes. The pulp, or underflows, are brought forward from one vat to the next by simple 12-in. diaphragm pumps. The filter for the overflow, as well as the one receiving the overflow of the 10-ft. thickeners, has 15 small-size leaves of the Moore type.

The cyanide solution is made up to the proper strength for the ore under treatment, at present 1½ lb. to the ton of solution in the agitator tanks. Sump solutions and overflows from various apparatus are pumped up by either small centrifugal or plunger pumps to their appropriate re-use or storage higher up in the mill. The mill laboratory work is carried on at a portable table fitted with burette stands, sink, etc., and situated now on the lowest level. The solution-storage capacity required, comprising only two 12-x20-ft. tanks, one of which is just up the hill from the ore bins and not yet under cover, is rather small, especially considering the varied kinds of ore likely to be treated.

Zinc Shavings Used for Precipitation

There are three 5-compartment zinc boxes, built of sheet iron and painted with P. & B. paint, the bottom sloping steeply to one side. The outlet of each compartment is at the middle of the low side instead of at the low corner, which would have been more convenient for cleaning out. Pregnant solution is drawn by means of two plunger pumps from the clarifying filters and delivered continuously through solution meters to three small pregnant-solution tanks above the zinc boxes. In the head compartment of each box is placed an electrolytic oxidizer, consisting of a frame carrying 20 anodes

and cathodes 5 in. wide and immersed 4 in. deep in solution. These serve as an antidote for cyanicides in the solution.

In cleaning up, the zinc is removed from a compartment and the precipitate washed down into a 4-ft. wooden vat set down into the concrete floor, using a 1½-in. hose screwed to the compartment outlet to prevent leakage or spattering. A single filter leaf, 20 in. square, connected to the suction end of a centrifugal pump, is used to collect the slimy precipitate from this vat. It is planned to replace this single leaf by a collector of 6 similar leaves, so arranged that each can be swung out of the tank by itself for removing the precipitate, thus making this part of cleaning up more continuous. The precipitate is scraped from the filter into a large iron pan, dried over a slow fire and screened to break up the fine zinc. It is then sampled and sold to the refinery. The zinc boxes are raised several feet above the floor to permit ready inspection and cleaning beneath. The floor, which is concrete, smoothly faced, slopes to a drain from which any spills can be easily gathered. Barren solution flows to the mill sump.

ARGO REDUCTION AND ORE-PURCHASING WORKS—TREATMENT SCHEDULE

Gold—Pay $19 per oz., if 0.05 oz. to 1.5 oz. per ton.
Pay $19.50 per oz., if 1.5 oz. and over per ton.
Silver—Pay New York quotation, date of assay, for 60 per ct. of the silver assay, if one oz. and over per ton.
Lead—Deduct 2% from the fire assay and pay 25c. per unit for the balance.
Copper—Deduct 1.5% from the wet assay and pay $1 per unit for the balance.
Zinc—No pay. No penalty.
Sampling—No charge for 12-ton lots and over; $1 per ton for less than 12-ton lots.

TREATMENT CHARGES

Gross Value of Ore per Ton	Charge per Ton
Up to $3	$2.00
Over $3 to $4	2.50
Over 4 to 5	3.00
Over 5 to 6	3.25
Over 6 to 7	3.50
Over 7 to 8	3.75
Over 8 to 9	4.00
Over 9 to 10	4.25
Over 10 to 11	4.50
Over 11 to 14	4.75
Over 14 to 20	5.00
Over 20 to 25	5.75
Over 25 to 30	7.00
Over 30 to 35	8.00
Over 35 to 40	9.00
Over 40 to 45	9.50
Over 45 to 50	10.00
Over 50 to 75	11.00
Over 75	12.00

A Colorado & Southern Ry. siding runs up close beside the mill at the lower level, so that concentrate has to be wheeled but a short distance from the bins to the cars. Coal for the boiler can thus cheaply be brought to the coal bin, and other supplies delivered conveniently.

Sapphire Concentration

SPECIAL CORRESPONDENCE

The method of recovering the stones from the ground of the New Mines Sapphire Syndicate, Yogo, Mont., is rather unusual and interesting. The matrix containing the stones is an intrusive igneous rock, weathered to a yellow clay, for a depth of approximately 20 ft. from the surface. From this portion the sapphires are easily separated by washing. Below this belt, where the rock is harder, it has been found necessary to disintegrate it by exposing it in piles to the weather and wetting occasionally. The ore is placed on inclined floors and left for several months during the winter; the frequent freezing and thawing causes the lumps to slack and disintegrate. A large stream of water is then played on the piles and the material sluiced similarly to placer gold. Beyond the first set of riffles is a settling basin, where the lump material, carried down, undergoes further disintegration; thence it passes over more riffles to the second and final disintegrating basin. The riffles are cleaned four or five times in 24 hr., and the concentrate separated in a rocker sieve into three sizes, the oversize from a ⅝-in. screen being carefully examined for sapphires before being discarded. Further concentration is then obtained by passing the material over screens with meshes of two different sizes, the larger sapphires being then picked out by hand. The smaller ones, suitable for watch jewels, etc., are shipped in the rough. The stones are shipped to London semiannually, where they are cut and then sent to the market.

Shaft-Sinking Methods at Butte

BY H. S. MUNROE*

Shaft sinking, an epoch-making affair in many camps, is in Butte an ordinary phase of mining. There is hardly a time, under average conditions, when new shafts or extensions are not in process of sinking. There is in the camp a class of labor, largely Finns and Canadians, young, strong and extraordinarily efficient, who do not deign to do mining work other than sinking. Constant practice has made them past-masters, and, given ordinarily good supervision, it is doubtful if as good a class of men for the sinking of vertical shafts with machines could be found anywhere.

THREE-COMPARTMENT SHAFT DESIGN

With a few exceptions the Butte shafts are of standard design, consisting of two hoisting compartments, each 4 ft. 6 in. by 4 ft., and a longer compartment which is usually divided into a small "chippy" compartment and a pipe- and ladderway. The wall plates are 19 or 20 ft. long and are usually not spliced. The end plates are uniformly 6 ft. long. The sets are put in on 5-ft. centers.

Depending on the use to which the shaft is to be put and the ground conditions, the wall and end plates are of 12x12-in. up to 12x16-in. timber, the greater dimension being always the vertical one. The spreaders (or dividers) are of 10x14-in. up to 12x18-in. material, the vertical dimension of the spreader being 2 in. more than that of the plates, thus giving the center posts an inch more bearing at each end than would be possible were the spreaders of the same vertical dimension as the plates. The corner posts are 12x12 in., and the center posts of 10x12-in. timber. Guide posts of 10x12 in. are often put in to give the guides a solid backing of timber. Lagging 2 in. thick is used and is wedged to as heavy a stringer as the ground space will permit, for instance, 5x10 in. Ordinarily 4x6-in. guides are used, but in cases where the shaft is to be used for hoisting a large tonnage with heavy skips, guides as heavy as 4x10 in. are installed.

PLACING THE TIMBERS

In placing the timbers the hanging bolts are left for five or six sets only, never more than ten. For lining in the timbers, comparatively short lines are used, care being taken to place the blocks on a perfect set when moving them down. It is seldom that more than five sets are lined in from the same set above. While the practice

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varies with individuals, generally four lines are used, one in each corner or one in each of three corners and another either in the middle of a wall or end plate or in a corner of the wall plate and a spreader. The sets are tried for level every 50 ft. and if found out of level, special posts are put in to bring the next set back to level.

Drilling and Blasting Methods

Up to a few years ago either two or three 3¼-in. piston machines were employed for sinking. This is still the prevailing practice but where conditions of ground and water are favorable heavy hammer machines are often used. The ground can be broken more closely with the latter and if conditions are right, fully as great speed may be realized. Where the piston machines are used, a couple of stopers and pluggers are kept available for plugging where the ground has not broken quite large enough for timbers. With piston machines the men try to pull enough ground for two sets of timbers each round. It does not often happen that this can be realized consistently, but occasionally it can. In one shaft which I watched for two months, 19 sets were placed for nine rounds the first month and 21 sets for 10 rounds the second. To do this sort of work it is necessary to finish with at least 14-ft. drills in the cut holes. Where hammer machines are used it is aimed to pull about 6 ft. to the round and this is often accomplished.

The greatest advantage of the air hammers over the piston machines lies perhaps in the blasting. Often the first blast will break bottom, whereas with the piston-machine rounds it is always necessary to blast twice and often three times. As to the practice with piston-machine rounds of blasting and mucking out the cuts first and then blasting the rest of the round, opinion is divided. It is undoubtedly the most economical procedure, but where cost is subordinated to speed, I rather favor blasting the whole round at one time, as occasionally luck favors the operator enough to allow of a clean break. Ground conditions are always a strong governing influence in this also; often blasting the whole round at once is sheer foolishness. In loading, two primers are always used with about 12 ft. of fuse for each. Electric firing is not in favor in Butte.

Mucking and Hoisting

Buckets swung under sinking cages are used almost universally and the muck is hoisted entirely through the middle compartment. One end compartment is kept lined for an air shaft and the other end bulkheaded every 50 ft. or so for safety. After a blast the men will go down and sink a "well" under the middle compartment, using round-point shovels. They will often get this 6 or 8 ft. under the level of the muck pile on the ends. Then keeping the buckets in this "well" they will place a slide of lagging and shovel with square-point shovels. With six men in the bottom, 100 buckets is not an unusual tally for a straight mucking shift of 7½ working hours. Two buckets are used, the empty being loaded while the loaded bucket is being hoisted, dumped and lowered.

Differing from the practice in many camps, when the loaded bucket has cleared the collar, doors are shut over the shaft, a car run on them and the bucket dumped directly into the car instead of into a bin or chute as one often sees elsewhere. The doors are 3 or 4 in. thick and are rigged up to a single counterbalance weight so that the labor of opening and closing is slight. The bail on the bucket is hung slightly under the level of the center of mass of the loaded bucket with a locking ring to hold the bucket in an upright position. To dump, the ring is merely knocked up and the bucket dumps itself. Until recently, large rocks were sent up in chains, but this having resulted in several fatal accidents, the practice was prohibited and nothing is now sent up except in buckets.

Timbers are sent down in the usual way. The wall plates are swung under the cage with chain and clevis and the short timbers lashed to the deck of the cage. Long sinking-shoes are used on the cages, but the guides are kept down to the second set from the bottom, the last set being placed minus one of its spreaders, to facilitate the landing of the succeeding wall plates.

As to safety: Ladders are kept down within three or four sets from the bottom and a chain ladder is usually hung from there down. The law requires two sets of signaling apparatus, usually the ordinary bell rope and an electric pull bob. Where available, clusters of electric lights on long extension cords are used for lighting. These are continually causing slight shocks in the wet shafts, but are preferable to candles.

Most of the sinking is done on contract or bonus, usually the former. The foremen hire and fire the men and everyone on the contract participates in the profits. Four, five and six men per shift are worked in the bottom, the fewer the men the greater the economy for both company and contractors. The contract price varies from $25 to $35 per ft. and includes all the labor of sinking, so far as the bottom is concerned, including extending ladders, placing bulkheads, etc., but not including any pumping or electrical work. The contract is usually made to require work three shifts per day and seven days per week, especially where water is bothersome. All men working in the bottom are guaranteed $4.50 per shift.

Nickel in Madagascar

In a memorandum to the Société des Ingenieurs Civils de France, M. Bonnefond, chief of the Service of Mines of Madagascar, says that a deposit of garnierite, said to be extensive, has been discovered by an English company near Ambositra near the east coast of the island. Some of the ore carries 7 to 8% nickel, but the average tenor will probably not be over 3 to 4%. About 10 km. distant there is a waterfall, which could be made to give 10,000 hp. for the operation of the mines. The ore mined would have to be carried down the river to Manonjary, which is a poor port, as vessels cannot approach within 4 km. on account of shoals. The estimated cost of transporting and loading the ore is 65 to 70 fr. per ton; freight to Marseilles or Havre, 55 to 60 fr. The deposit is on a high plateau, 1300 m. above the sea level.

Utah Asphalt for Road Building is to be tested at Washington by B. H. Burrell, senior road engineer in the Government service. On the receipt of the report, it is proposed to build for experimental purposes a roadbed one-quarter mile long between Salt Lake City and Murray. Following the advice of Mr. Burrell, it is the plan to lay the road in stretches, side by side with the asphalt in various combinations, so as to ascertain the best method of treatment. The combinations are in general to be as follows: Gravel base with rock-asphalt facing; slag base with rock-asphalt facing; concrete base with rock asphalt on clean concrete surface; concrete base with a brush of bitumen and rock-asphalt facing over bitumen. The road is to be built by the county commissioners at an estimated expense of about $2000. The experiment will be of much value in the campaign of road building to be undertaken by Salt Lake County.

Sanitation in Mines and Mine Towns*

SYNOPSIS—Improved change houses are being built in Lake Superior region. Underground conditions should receive attention. Sanitation around the miners' houses of the greatest importance. Improvements necessary in sewage, garbage and manure disposal. The outdoor privy is a constant menace. School training and visiting nurses can accomplish much good. Good work by some companies should be continued and imitated.

It is undoubtedly true that better living conditions around the mine and better physical health make for more satisfactory service got from the miners. The health of the men may be conserved in many practical ways. Much has already been accomplished and due credit should be given to the many companies in the Lake Superior region who have paid special consideration to the health of their men.

The old wooden drys are now being replaced by buildings equipped with abundant hot and cold water, individual basins or buckets, lockers for street and mine clothes, and drying and ventilating systems which effectually take care of the wet clothing of the miner. The plan of suspending the wet clothes by means of a rope or chain, with individual lock, has much to commend it. The shower bath, a part of all modern drys, has made bathing possible for the men who have not the proper facilities at home. Their constant use has demonstrated their value. The introduction of water closets in the drys has not always met with complete success, but in most cases it is working advantageously and improving the underground conditions.

Conditions Underground

Dry closets should be placed in every main level underground and should be provided in the ratio of one to every 25 men. These closets should be made of wood or iron of a size to be conveniently handled by two men, and should be taken to the surface, emptied and washed out with a hose. Lime should be kept convenient to the boxes and used regularly. There is no more fruitful source of disease than the human excreta left in the mine workings.

The drinking water should have the most careful attention and under no circumstances should the men be permitted to drink water that is not known to be pure. This can be made possible only by furnishing good water so that it can be readily obtained. The plan of the Oliver Iron Mining Co. in providing bubbling fountains, thus doing away with the old dirty drinking cup, is to be highly commended.

Anything that will lessen the frequency among our miners of tuberculosis, typhoid, diphtheria, scarlet fever and other contagious or communicable diseases, should be carefully considered. There should be a more rigid quarantine in contagious cases, and the mining companies should coöperate more fully with the health officers, making and enforcing regulations designed to improve our unenviable record in this matter.

Owing to the relation that the physicians bear to the mining companies, they may hesitate to suggest things which might appear as criticism of existing conditions or methods of mine management, and they should therefore be given full authority to correct undesirable conditions. I believe we would get better results in this matter of sanitation by employing the physicians, at a stated added remuneration, to make periodical inspection of the properties.

Proper ventilation should be provided underground, thus adding to the efficiency of the men and incidentally prolonging their lives. Tuberculosis and similar diseases would then be less prevalent.

Sanitation in the Home

The sanitary condition of the home has a great influence on the lives of the men. What can reasonably be expected of a man living in unhealthful surroundings? I believe that the mining companies owe a duty to the men employed by them and to the community in which they live. One of the most efficient ways of fulfilling this obligation is to provide satisfactory homes, with healthful surroundings for the men and their families. Any work of this kind must be done in such a way that the men will be led to coöperate and there will be no suggestion of paternalism. The importance of providing houses for rental is generally recognized but after the house is provided it is just as essential that its condition be not neglected. We have seen houses where the waste water must be thrown out upon the ground. The advantage of this in providing a good place for the propagation of fish worms is offset by its assistance in the propagation of other less desirable things. The old boxed-in cupboard sink may yet be found. It is a place for refuse and vermin, a rotten, dirty, slimy hole. Where such exist, let them be torn out. The drainage around the houses and other properties requires careful attention. Ditches should be dug and kept open, even if the boys fill them up, and no stagnant water left to breed mosquitoes and infection.

Garbage, Stables and Privies

Garbage and refuse should be deposited in covered receptacles, preferably galvanized-iron cans, and where such services are not rendered by the city or village, the companies should provide for its regular collection and disposal not less frequently than once a week. It has been found feasible in some places to have the occupants of the premises purchase the cans, which are supplied at wholesale rates, or through the company at cost, with the understanding that proper collection is assured. Rubbish should not be dumped around promiscuously but should be deposited in a designated place, collected and disposed of. Few of the men have time or facilities for economically doing this, and if not looked after by the city or the company, it will not be taken care of at all satisfactorily. A refuse burner, costing little, can be so located as to make the disposal of rubbish a simple matter and comparatively an inexpensive one.

It is desirable in many cases to permit the keeping of a cow or horse, but provision should be made for the care of the manure. It should not be allowed to accumulate from month to month, but should be removed promptly. It also should be treated with chloride of

*Reprinted from a paper entitled, "Sanitation for Mine Locations," by W. H. Moulton, secretary of the pension department of the Cleveland-Cliffs Iron Co., Ishpeming, Mich.; prepared for the Minnesota meeting of the Lake Superior Mining Institute, Aug. 26, 1913.

lime, or with a kerosene and carbolic acid mixture. In those localities having no sewer connections, the question of privies is a serious matter. Too often the privy is set on the ground with no proper receptacle for the human excreta, and this often spreads over the ground, even if a pit is dug. This is frequently allowed to collect throughout the season and become a menace to the family. The houses being more or less open, vermin enters without hindrance, and the ever-present, disease-carrying fly, fresh from the privy, feeds on the baby and the household food. We have just begun to appreciate the danger from these pests. The companies which have already set an example in their campaign against the fly should be congratulated, and the rest of us stimulated to an equal effort. These outhouses should be provided with a proper receptacle, be emptied and properly cleaned at regular and not too infrequent intervals. Either earth, slacked lime or chloride of lime should be constantly used.

Much good can be accomplished by the teaching of sanitation in the public and parochial schools. The value of the physical inspection of school children is only just beginning to be appreciated. It is a health precaution of great merit and should be in effect in all our communities.

The most efficient agency in extending the benefit of this work of sanitation is the visiting or public-health nurse. A number of mining companies in the Lake Superior region have already introduced this service with much success. No other person can have the same opportunity to reach the homes and the members of the families and to teach the benefits of fresh air, cleanliness and other sanitary precautions. The importance of fresh air is a point that cannot be emphasized too strongly. The mining companies are to be commended for the work that has been done for the men, their families and the communities in which their operations are conducted, but with this commendation must come the realization that there is still much to be accomplished.

Utah Copper Co.

Report of operations of the Utah Copper Co. for the second quarter of 1913, including April, May and June, shows that the production of copper in concentrate was 9,834,894 lb., 10,312,605 lb. and 11,637,949 lb. for the respective months, a total of 31,785,448 lb. A total of 1,910,214 tons of ore were treated, 55% in the Magna mill and 45% in the Arthur plant. Average grade of ore was 1.2807% copper.

Copper was produced at an average cost per pound of 8.933c. If miscellaneous income in Utah, including that of the Bingham & Garfield Ry., were applied as cost reduction, the cost per pound of copper would be reduced to 8.160 cents.

Earnings for the quarter are on a basis of 15c. per lb. received for copper. The total amount in hand, sold and unsold, at the end of the quarter, was 33,620,594 lb., inventoried at 13.778c. per lb. No copper due for delivery from the refinery remained unsold.

Both plants were in continuous operation, averaging 21,000 tons per day. Financial results are as follows:

Net profits from milling operations	$1,832,071
Other income, rents, etc., in Utah	11,495
Income from Nevada Cons. Copper Co. dividends	375,187
Total net profit for the quarter	$2,218,753
Dividends paid	1,186,628
Net surplus for the quarter	$1,032,125

The Action of Oxidizers in Cyaniding

Commenting upon a former paper by Morris Green[1], W. B. Chomley, of Western Australia[2], remarks that he agrees with Mr. Green and has not found any beneficial effect from oxidizers in cyanide solution. From the fact that cyanide itself is a strong reducing agent, it appears to him that the action of an oxidizer in the presence of KCN cannot do anything but harm. Of course, bromocyanide might be quoted as an exception, but as its use has only proved of value in dealing with telluride ore, it seems probable that its beneficial effect is due to some inherent quality which enables it to attack the tellurium, rather than to its oxidizing action.

When experimenting with $KMnO_4$ in cyanide solution he noticed a strong odor of ammonia. In fact, J. Moir and J. Gray pointed out that NH_3 was one of the products of the action of $KMnO_4$ on KCN in their paper on "The Destruction of Cyanide." The estimation of KCN by the common method with $AgNO_3$ in the presence of NH_3 would be unreliable, and it may be that the unaccountable failure to get gold in the solution under some conditions is due, to some extent, to the fact that the quantity of KCN which was shown by testing was not really there. That this decomposition of KCN into ammonia will go on sometimes without the addition of artificial oxidizers, there is some evidence. At one time periodical tests of the efficiency of the roast from a furnace working on sulpho-telluride concentrate, had to be made. This was done by shaking for a given time a weighed quantity of the roasted product with a measured quantity of a standard solution of KCN and then estimating the loss of KCN. On some occasions it appeared that the strength had actually increased to considerable extent. On further investigation, using stronger solutions and more ore to exaggerate the results, ammonia fumes were given out in noticeable quantities. That this was not due to any peculiarity of the cyanide itself, was proved by the fact that, using the same KCN solution on different samples of ore, the same result was not always brought about. This presented the possibility of all sorts of errors when making comparative tests of any kind with different solutions of apparently the same strength. Since that time when treating low-grade slime, it has often been noticed that the treatment samples showed that the solution of gold had stopped while there was still apparently 0.02% KCN present, and no amount of extra agitation would reduce the gold value; but on the addition of more KCN the undissolved value immediately dropped to a trace, although there was no apparent alteration in the KCN strength. The only explanation of this is that in the first place there was no KCN present, and the reaction when testing with $AgNO_3$ was due to a small quantity of ammonia.

It is apparently true that the whole of the author's paper goes to support the experience of most metallurgists, namely, that in connection with the cyanide process, all oxidizing should be done on the ore before coming into contact with the cyanide.

Large Deposits of Lead and Zinc ore on the Red Sea are reported to have been discovered recently at Gabal-el-Rossas, about 540 km. south of Suez, near Mersa Helena Bay.

[1]Journ. Chem., Met. and Min. Soc., So. Afr., Feb., 1913; also Eng. and Min. Journ., June 21, 1913.

[2]Journ. Chem., Met. and Min. Soc., So. Afr., May, 1913.

Conditions in the Joplin District

By Temple Chapman*

SYNOPSIS—A discussion of conditions in the Joplin, Mo., district, considering the variety of orebodies and their principal characteristics. Sheet deposits occur in the Webb City and Joplin sections, while at Miami, steady veins are usual. Royalties are lower than formerly.

In 1912 the Joplin district received between $50 and $60 per ton for top-grade zinc ore, prices not reached in any former year. The increasing zinc production of Butte and other Western points and the decrease in the tariff on zinc ore and spelter make it unlikely that Joplin operators will get better than an average price of $45 per ton in the future. Operators are heeding this probability in the character of prospecting they are now doing.

The different camps scattered through the Joplin district vary greatly in the character and size of their orebodies, in their working costs and in the kind of milling plants required.

The sheet-ore mines of Webb City and Joplin recover an average of about 2½% of blende; which is a value of only $1 per ton of rock when concentrate sells for $40. Mining and milling costs average about $1 per ton. Sheet-ore mines have improved their methods until many plants handle up to 600 tons of rock per day. Several such mines make a recovery of 3% to 3.5% blende and show the high output of 100 to 120 tons of concentrate weekly. Casually, this appears to yield a large profit, but 100 tons of $40 concentrate, less 10% royalty, leaves only the $3600 necessary to pay $1 per ton on 3600 tons of rock. Of course, when ore was selling at $60, such mines were profitable, but their investment cost is so high, say, $50,000 for drilling, shafts, plant and general getting underway, that the average sheet-ore mine hardly has a chance to get back its investment during the time of "peak" prices and breaks even or worse during times of ordinary prices. Regular and large areas of ore in sheet ground are attractive to the investor, but for practical mining results the regularity of sheet ore proves deceptive. What otherwise is a regular formation over 40 acres will show richer pay streaks and leaner loss streaks.

Thom Station Mines Require Small Capital

Thom Station possesses, in the Pocahontas, the greatest producing mine ever known in the Joplin district. The Thom Station mines are in soft timber ground and the ore deposits are irregularly shaped rich pockets, 9 out of 10 of which have been too small to return profits equal to the investment. Mining costs per ton of rock are high, owing to the small tonnage obtainable from restricted ore faces in ground requiring heavy timbering. Smaller plants, cheaper sinking, etc., mean much smaller investment requirements than sheet ground and make Thom Station more of a poor man's camp. The ore is "free" and a mine may be opened up by sinking a shaft into ore and may then be operated, perhaps profitably, with no other top plant than a portable boiler, hoist and three or four $30 "hand jigs." There are still a few successful hand-jig plants once so universal over the Joplin district, but now impossible in most camps.

I referred to the "free ore" at Thom Station. Most of it consists of pebbles of zinc in loose muddy ground. The crude ore, by sluicing or hand-jigging and without crushing, yields high-grade concentrate and the process may be compared with placer operation.

Neck City and some sheet-ground mines have "free-milling" ore, but it must be crushed out of hard rock and cannot be jigged by hand. Galena, Miami and Webb City low-grade sheet ground produces a so called "chatty" or finely mixed ore in hard rock which contains lead and iron and some oil, and yields a poor concentrate.

The mines at Neck City have always been notable for containing large pockets of disseminated ore yielding 6% to 8% of high-grade concentrate. A higher proportion of mines at Neck City have been profitable to their owners than in any other camp in the district. Hence drill-hole ore discoveries indicate different things with the same amount and grade of drill cuttings, depending on the camp in which the strike is made. In Thom Station a rich hole may have found only a small pocket. In Neck a good hole means almost sure success. So too in sheet ground, rich ore (or poor) occurs in big patches, big enough to reward one for opening ground and building a mill. In Miami a good hole usually indicates that the lucky driller has hit a vein and the experience there has been that the vein is as long as is the property. I will speak of Miami later. In general it is becoming plain that although all Joplin ore deposits have certain common characteristics, each main camp (Joplin, Webb, Carterville, Neck, Alba, Miami, Galena, and others) has its own individual peculiar features which are decidedly marked and must be taken into account by investors and prospectors who hope to have success reward their mining.

We consider Miami, the most southwesterly camp, as having what may be called very intense vein formation, although veins or channels of ore have not been unknown elsewhere.

Springfield to the east has mines with veins as long and as regular as any in Miami. Aurora, Peacock, Thom Station (Tuckahoe) and Porto Rico have also had long-channel mines. The enriched portion of sheet ground also often runs in channels, and channels or half circles of ore have made rich mines in Chitwood, Neck and Prosperity.

Ore Deposits Not Regular

Our generalizations work down to the local miner's theory that ore is where you find it and in actual mining, especially in exploration and prospecting, the theories and geology only guide by the warning to keep a sharp lookout for the local camp features and peculiarities. For instance; pocket mines are usually overlaid with shale and clay, often discernible from the surface, and sheet ore lies under lime, which is indicated by a surface of reddish boulders and flint ground. The old idea of prospecting in the "draws" or valleys was due to

*Webb City, Mo.

the same theory; that such depressions indicated "soft ground" or absence of limestone.

The Miami ores occur chiefly in long veins, sometimes nearly flat but oftener near vertical, 20 to 30 ft. thick and of largely unknown depth and length. The original ore vein or channel has been worked north and south for over a mile and from 100 ft. deep down to over 200 ft. and still going. Parallel and branch veins are being discovered by drills and proven by shafts which extend the camp from Miami north to the Kansas line, about 8 miles. Some think a solid, continuous vein has been delineated and they claim Miami deposits have the regularity and certainty of sheet ground with the richness of soft ground.

But actual mining is hardly so satisfactory as this theory and shows the ore vein to resemble a string of sausages rather than a rope. Hence Miami offers the prospector the same pleasing uncertainties of mining in general, and the drill prospector finds sometimes the rich sausage and sometimes the lean string in between. However, one may drill on the strike of the vein a mile or two ahead of the camp and have fair chances of hitting ore.

The big areas of prairie land which have been obtainable from the Indian owners at low royalties have offered big prizes to the prospector. These favorable terms permit the successful drillman who holds, say, 400 acres at 5% to sub-lease portions of his holdings at a moderate advance in royalty, say, 40-acre lots at 10% and thus obtain success upon very little capital investment. Many operators from Missouri are watching the Miami developments and are glad to sublease land in the main ore range where the local prospectors have proven the ore and are willing to pay them reasonable royalties. Joplin is fortunate in its skilled native nonunion labor and in its cheap power, coal, gas and electricity. Royalties are perhaps somewhat lower than formerly and many companies are buying land and avoiding royalties. The Joplin district is in a healthy condition, although ore prices will probably be $10 or $15 lower than in 1912, and should prosper in the future.

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The Reclamation of Flue Dust

The treatment of iron blast-furnace flue dust is discussed in the *Iron Trade Review*, May 1, 1913, by Albert F. Block, the article being based on work at the Northwestern Iron Co. In the nodulizing process, flue dust is treated in kilns similar to cement kilns in construction. They are usually about six feet in diameter, and from 80 to 120 ft. long, and are lined with firebrick. The flue dust is heated in the kiln by means of powdered coal, which is blown in at about nine ounces nozzle pressure. The amount of coal required is about 300 lb. per ton of nodules.

Fuel oil and gas have also been used, but they increase the cost of operation above that with powdered coal. The temperature of the kiln in the hot zone is about 2500° F. Exact temperature control is difficult to get on account of the variable coke content of the flue dust. The nodules produced by this process are usually dense and often fused and glazed, and therefore do not offer a large surface contact for the reducing gases in the iron furnace.

Furnaces which are using nodules thus produced show an increase in production and a decrease in the coke consumption, but it is plain that not more than 10% of nodules can be used successfully, and that the best results are obtained with not over 6%. The kilns are inclined about six degrees from horizontal, and to prevent the nodules from fusing onto the brick, a heavy chain is passed through the kiln and is allowed to drag on the brick while the kiln is rotating. The cost of producing nodules in the rotary kiln is about $1.25 per ton, and the nodules contain 60 to 65% of iron.

The Heberlein Process

So far as is known, only one Heberlein pot is used in the United States for the treatment of flue dust. This is in operation at the Zenith Furnace Co.'s plant, at Duluth. The standard Heberlein pot is 9 ft. in diameter, 4 ft. 6 in. high, and is a single casting. The grate is 15 in. above the bottom, and the conical holes in the grate are ⅜ in. in diameter.

The Gröndal process is stated to have been only a partial success on flue dust, owing to the great variation of the carbon content. This renders it impossible to regulate the heat of the kiln. For instance, with a high-carbon flue dust the extra heat generated causes the briquettes to fuse, and in this state the mass runs down between the cars and the side walls of the kiln. When the car is moved out of the high-temperature zone, the fused mass becomes solid, making it impossible to push the car any further. On the other hand, if the kiln is not operated at a temperature high enough to ignite and burn all the coke, the briquettes are soft and produce a large amount of fines. By working with a mixture of 75% of fine ore and 25% of flue dust, at the Northwestern Iron Co., results with the Gröndal process have been satisfactory. The kilns are 6 ft. wide and 195 ft. long. The cars are 6 ft. 6 in. long and 6 ft. wide. The kiln therefore holds 30 cars, each loaded with one ton of briquettes, and a car is discharged every 15 min. Crude oil is used for fuel. There are three combustion chambers per kiln, and two burners to each combustion chamber.

The fine ore and flue dust are tempered by means of a spray pipe discharging into a pug mill. The material is delivered to small hoppers over the presses, from which it is fed in the presses mechanically. Each kiln requires two presses, and each press one operator. These operators take the briquettes from the presses and put them upon the cars, which are two tiers high. When the car has been loaded, the charging door is opened and the car is moved into the kiln by a mechanical pusher. The admission of a car automatically discharges the car of burned briquettes.

The cost of producing briquettes is about $1.55 per ton, divided as follows:

Labor	$0.41
Fuel	0.60
Repairs	0.15
Interest and depreciation	0.20
Royalty	0.09
Power	0.10
Total cost of briquettes	$1.55

It will be noted from these figures that briquetting by the Gröndal process is an expensive means of preparing fine ore and flue dust for the blast furnace. The process also consumes all of the coke in the flue dust. The cost of a four-kiln plant is about $100,000.

Churn Drilling in Southwestern Wisconsin

By W. F. Boericke*

SYNOPSIS—Operation of churn drills in Wisconsin is carried on principally for prospecting. The deposits are usually not more than 150 ft. deep, and light rigs may be successfully used. Both steam and gasoline machines are favorably regarded. Difficulty results from drilling through broken or open ground in which drillings may be lost. Drilling must be systematically and carefully carried on in order that valuable information shall be secured. Drill holes are used for ventilation and other purposes, aside from their use in prospecting.

The ore in the Wisconsin zinc field is confined to the Galena and the upper part of the Platteville limestones. Below what is locally called the glass rock there are no evidences of zinc in commercial amount. This fact is so well established that no drilling is ever attempted there.

Drill Holes Are Comparatively Shallow

Holes are comparatively shallow, varying with the contour of the country, but rarely exceeding 200 ft., except in the extreme south end of the field. The majority of the holes are 125 ft. or less to the glass rock. The formations that must be drilled through are, in order, the gray rock, the brown rock, the blue rock and the "green bed," all of which belong to the Galena limestone, then the oil rock, clay bed, and glass rock, which come under the Platteville, or Trenton classification. Considerable flint is found in the upper part of the Galena limestone, which is a true dolomite, and varies much in hardness. It breaks well, and there is usually no trouble in making a clean separation of the zinc from the limestone. This fact is important in connection with testing drill cuttings.

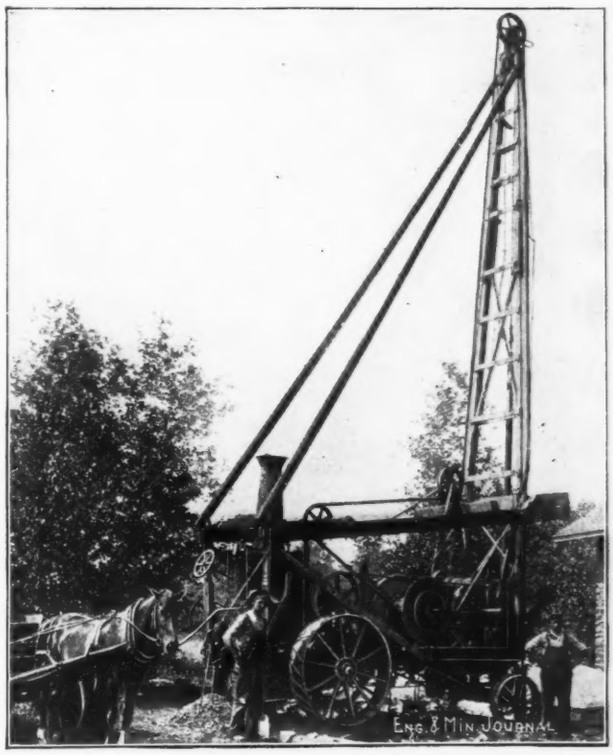
Drill Cuttings Are Difficult to Save

The water level is usually encountered near the blue ground, and this makes it easier to sludge out and keep the hole clean. A strong flow of water, however, is detrimental, as the cuttings are either lost entirely or the fines carried away and a wrong impression gained of the value of the ground. Crevices are common, and this means more trouble for the driller to keep the hole perpendicular and prevent sticking and lost tools. Often the hole goes through open ground consisting of a vug or pocket lined with calcite crystals, and here again there is danger of losing all the cuttings of the last run. Where the ground is inclined to cave or run, or where there is much open ground to be drilled through, the holes are frequently cased, but this casing may be recovered later if desired. Core drilling has never been an unqualified success in the district, on account of the higher cost, and because it is often impossible to get good cores on account of broken and open ground, which also causes deflection.

Steam and Gasoline Drills Each Have Advantages

Both steam and gasoline drilling machines are common in the Wisconsin field, and as the holes are shallow, the drills are comparatively light. This is important, as most of them are nontraction, and the drills must frequently be set up on hills or slopes where horse power only is available. The gasoline machines are equipped with single-cylinder engines of 6 to 10 hp., while the steam drills are usually rated at 12 hp., the No. 3 Keystone being a popular size. Derricks are 30 ft. high and the rope used is 1¾-in. hawser-laid manilla.

Each type of drill has advantages, and with experienced drillmen does good work. The gasoline drill is the cheaper in first cost, and is lighter and easier to handle. This is a positive advantage in moving round a rough, hilly tract of land. Only one man is needed for its operation, the engine requiring no attention, but usually a



One Type of Steam Drill on Wisconsin Zinc Fields

helper is needed for sludging out, shaping the bit, etc. There is less trouble in providing fuel than with a steam machine, while with the latter there is some difficulty in supplying water to the boiler. If another drill hole is near-by, a small gasoline pump-jack is used to supply water through a pipe line, and this, in winter, is likely to give trouble by freezing up. If this is not possible, the water must be hauled in barrels at additional expense.

Steam Drill More Reliable

On the other hand, the steam drill is far more reliable, is a heavier and sturdier machine, adapted for deeper holes, and with a skilled operator is more flexible. The blow can be varied better to suit the nature of the ground, and greater drilling speed and cleaner cuttings obtained. So much depends on the willingness of the human factor

*Mineral Point, Wis.

to take pains; on his knowledge of the ground and previous experience in orebearing formations, that it is hard to say that better results can be obtained with one machine than another. Mere speed in itself counts little; clean cuttings, a minimum of fines, and a saving of all metallics possible are what is wanted. Speed is only the main object when drilling for other purposes than prospecting, as for ventilation or for water.

Two men are usually needed. The drillman himself manipulates the drill, feeding additional rope as needed, turning the drill, etc. His helper attends to the boiler, on a steam drill, assists in sludging out, sharpens the bit, and is generally useful.

Under ordinary conditions in average rock, the drills, both steam and gasoline, run about 44 strokes per minute. As has been noted, the steam drill is more flexible than the gasoline, and the makers claim a quicker upstroke, with lessened danger of a struck drill. The latter is the bane of a driller's life for it often means a day's tieup, with the chance of losing his whole string of tools, which involves a considerable expense for a poor man, when accompanied by the necessity of drilling an entirely new hole.

Ability of the Operator the Most Important Factor

There is no question that for deep drilling the steam drill is easily superior to the lighter built, cheaper gasoline machine. But with shallow holes, not over 150 ft., both seem to make about the same daily progress. Much depends on the skill of the driller, and his familiarity with the ground. Then naturally the time of the year in which the drilling is done counts a good deal in drilling speed. The drillmen have to work usually in the open, protected at best by a flimsy shed, open on one or two sides, and affording little protection from the wind and cold. It is remarkable that they stand up to it as they do, for they frequently keep up their monotonous work in below-zero weather, without, however, reaching summer speed.

During January, a gasoline machine put down three holes in 13 working days, totaling 337 ft., or 24 ft. per day. During the same month a steam machine put down one hole 146 ft. deep in eight days, or 21 ft. per day. Another steam drill put down a hole 258 ft. deep in 10 days, or 25.8 ft. per day. These are fair average figures in ordinary ground, without breakdowns or accidents. Of course, the holes being drilled for prospecting purposes, some time was lost in washing the cuttings and testing for zinc and lead.

Drilling Usually by Contract

The usual method in this district is to contract for drilling instead of putting machines in the field and paying for labor, fuel, etc. The contract price varies from 60c. to 75c. per ft. This is inclusive of expense of moving, setting up, and removing the drill. It is usually understood that the hole must be completed in order to get the contract price.

The actual daily expenses of running a gasoline drill may be approximated thus: One man each at $3 and $2.25 per day, $5.25; 4 gal. of gasoline per 10 hr. at 20c., 80c.; moving drill, one-fifth of $5, $1; repairs and depreciation, $1; total, $8.05. If daily progress of 25 ft. be made, at 60c., this leaves $6.95 profit for the contractor. From this an allowance must be made for breakdowns, lost tools, etc. There is no record of any contractor getting rich overnight.

Intelligent Drilling an Aid to Prospecting

On the practical value of drilling as an aid to prospecting much has been said pro and con. It is only lately that drilling has been put on a really scientific basis in this district. Previously it was intrusted to men interested in making footage only, and entire reliance was placed on their testimony without other supervision or assistance. Results were gathered in the most haphazard fashion, regular reports and maps were unknown, and thousands of dollars were spent for small result. Accurate maps and plats of the drill holes were seldom made, and as a result, instances have been only too common where shafts were sunk or drifts run based on insufficient data, with discouraging results. Consequently, drilling is regarded in some quarters with unmerited disfavor.

Despite the undoubted fact that most drillers make a conscientious effort to give their employers an honest report, neither oversanguine nor too conservative, too much reliance should not be placed upon them. The personal equation varies too much. I once submitted a sample of zinc cuttings to three drillers. The first declared they were extremely rich and as good as he ever saw; the second said they were moderately good, no more, while the third was quite unimpressed. As a matter of fact, the cuttings were rich, assaying over 30% zinc. If a man is used to drilling rich ground, he will be quite indifferent to "shines" of jack. The reverse will be true where a driller has had a run of blank holes.

It is generally recognized that the drilling must be done in a systematic manner to be of any use for planning development or prospecting. If it is not so done, the results are liable to be misleading and dangerous. Daily reports should be made out of the number of feet drilled, with a detailed statement of the character of ground cut, presence of materials, water level, etc. Sludgings should be tested every 3 ft. in blank ground, and as often as necessary where ore is cut. The greatest care is necessary to clean out the hole and prevent salting of cuttings, otherwise a small sheet may appear to be several feet in thickness, by contaminating succeeding sludgings. Samples of all cuttings should be arranged regularly in little piles, marked with the depth, so that the examining engineer can check up the driller's report on his visit. An accurate survey should be kept of the holes, and elevations taken of the surface, that profiles may be made in the office. In this way all dips and rises of the orebody may be known, and the shaft so planned as to make drainage and tramming most economical. The daily reports received should be condensed and embodied in a general report of the whole, showing a complete record, with all changes of formation, crevices, openings, in fact, anything that may be valuable in subsequent development.

Ore Is Examined under Microscope to Determine Value

All cuttings are first carefully panned and washed and then examined under a microscope for ore. In this field the only materials reported are galena, jack, pyrites, known locally as "sulphur," and calcite crystals, called "tiff." Frequently the unwashed cuttings are dried and

assayed, giving the approximate worth of the ground in units of lead and zinc. But after sufficient experience an engineer can estimate closely what a sample of cuttings will run without resorting to assay. By taking into account the formation in which they occur, he can tell if the ore makes on the top flat, the pitch, or the oil-rock, and thus gain valuable information for subsequent mining.

In spite of the most careful work, however, it is easy to arrive at wrong conclusions. If a hole strikes an ore-bearing crevice running vertically, there will be cuttings all the way down, and thus give the impression of a very rich orebody, when the sheet may be only half an inch wide, with bare walls on each side. The same thing is true of a pitching crevice, which may appear to be much wider than it really is. If the drill is dull, the ore may be ground into powder and escape without detection in the wash water. If the ground is open or pockety, the cuttings may be entirely lost, and the blank hole reported where payable ore exists.

Multiplicity of Holes Necessary for Positive Information

The only salvation is to drill enough holes to remove uncertainty. If an apparently rich hole is drilled, but a circle of holes in a 50-ft. radius fails to show a continuation of the run, the presumption is that the first hole went down on a rich seam, and no payable body exists. Common sense plus geological knowledge is needed to prospect ground successfully. It is generally cheaper to spend money in proper drilling than incur the expense of sinking a shaft on unjustified hopes.

Intelligently planned drilling should show to an operator the presence of ore, the probable height of stope, the general direction of the run, the probable grade of the ore or percentage of "sulphur" to jack, and the amount of water to be handled. Also the general dip of the orebody, and the best place for the shaft.

Drill Holes May Serve Other Purposes Than Prospecting

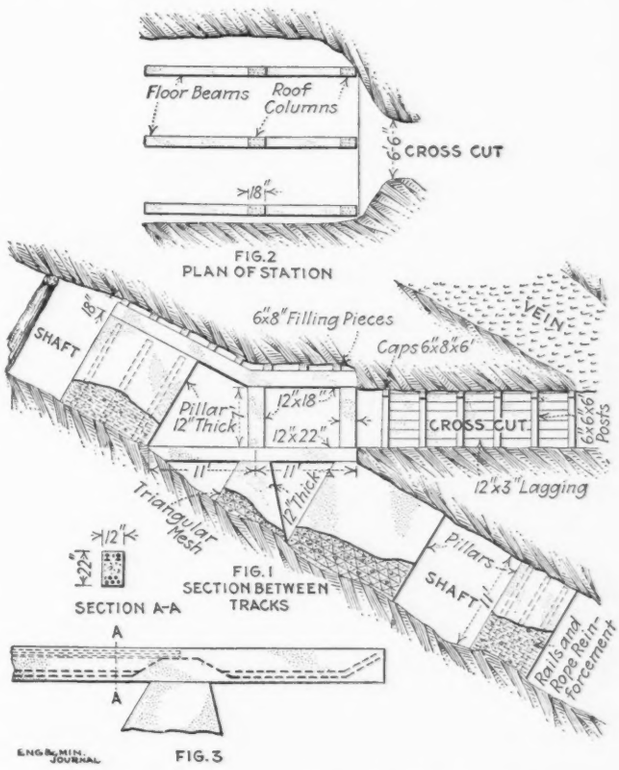
There are other uses of drill holes besides prospecting. Where there is no escape shaft, or where ventilation is poor, three or four drill holes are necessary for air in the hot summer months, and in case of a serious accident to the shaft, might save the lives of the men underground. When drill holes are used for air, it may be necessary to provide forced instead of natural drafts. Holes dripping water entrap a great deal of air into the mine, on the principle of the hydraulic compressor. If these are at a lower elevation than the shaft or other holes, they may furnish all the air necessary for a shift. Otherwise a small fan and electric motor make a good outfit. Some mines equip the drill holes with sails, which are free to revolve with the wind, and so force additional air into the workings. Drill holes should never be left open. If cased to the surface, they should either be carefully covered with boards or rocks, or if it is desired to keep them open, the casing should be extended 6 ft. or more above the ground. Otherwise they are a menace to stock, as well as a source of danger to the men below.

Frequently water and air lines are run directly to the surface from the mine through drill holes, thus saving shaft room, as well as eliminating needless piping and friction where there is not a straightaway run to the shaft. This saving might well pay in a short time for the expense of drilling for this purpose alone. Drill holes have been also used for draining water during shaft sinking, and for providing air in raising.

Concrete Shaft Station, Wolverine Mine

By Claude T. Rice

At the twenty-first level of the Wolverine No. 4 shaft, which is sunk in the foot wall, leaving a brow of rock between the station and the lode, the ground became heavy over the station and caused much trouble. It was necessary to retimber the shaft frequently, as timbers did not last longer than six or eight years, failing by decay alone in that time. Whenever it was necessary to retimber, it was also necessary to remove much of the ground, which caused a repeated enlarging of the arch over the



Concrete Supports for Heavy Ground

station. In an attempt to overcome this difficulty, W. F. Hartman, the company engineer, suggested that reinforced concrete should be tried for supporting the ground. The plan was adopted by Fred Smith, the superintendent, and the station which was put in has now stood for over a year, with no sign of failure in the concrete.

The station is illustrated in Fig. 1. It will be observed that there are two heavy tongues of ground, one between the crosscut and the vein and the other between the floor of the crosscut and the roof of the shaft. Before the upper one could be supported by concrete in the crosscut, it was necessary to place reinforced pillars under the lower one. Unless these two tongues

were firmly held in place, there would be a tendency for the whole piece of ground to slide down the shaft.

For these concrete pillars a mixture of about 1:2:6 or 7 was used, reinforced by such suitable iron scrap as lay about the mine, old rails being the most available. There are, however, two objections to the use of scrap for reinforcement. It should not be rusty or the bond between it and the concrete will be defective; and furthermore, it is necessary to watch the workmen closely to insure that the reinforcement will be put in properly and in the desired quantity. Strands of old hoisting cable, properly cleaned by means of a wire brush and a hook worked in between the strands where the worst of the rope dope is to be found, serves admirably for reinforcing, as the use of the rope in hoisting has removed practically all of the stretch.

Another method of reinforcing pillars is to use made-up reinforcement forms, which can be built into columns at the surface or nailed to the forms before the concrete is poured. Triangular-mesh reinforcement, which is put on the market by the American Steel & Wire Co. is handy, owing to the fact that it is hinged at each of its main members. Expanded metal is also good, but Hy-Rib, although it saves the cost of forms, is too expensive to use underground. Mr. Hartman prefers triangular-mesh reinforcement, and he uses style 42, which is 4-in. mesh material, folding nicely into reinforcing columns for the sizes of posts and pillars generally required in mine work. In his work, he has evolved standard forms that can be made up by the blacksmiths during spare time. For instance, triangular-mesh of the style mentioned, is purchased in the so called 30-in. rolls, and can easily be made into columns two mesh, or 8 in. wide, by 5 mesh, or 20 in. deep, by wiring together two lengths of the reinforcement. Mr. Hartman stiffens such a reinforcing column as this, by means of wire lacing running both crosswise and diagonally through it. It is possible for two men to make up ten 8-ft. columns of this kind in two hours.

Triangular Mesh for Reinforcing Pillars

In Fig. 1 is seen the triangular-mesh reinforcement. This is put in with its narrower side down, and is centered in the form. The concrete, which has been mixed usually on the level above and slid down the shaft in troughs to the platform, is then shoveled into the form, the sides of the latter built up and more reinforcement columns put in as the concrete rises. To guard against a plane of weakness developing in the finished pillar, the reinforcing columns are wired together. The work of shoveling the concrete into the forms and of tamping, is made easier by placing the reinforcement in the pillars crosswise instead of on end. If desired, the concrete pillars can be reinforced with rails and ⅜-in. strands of 1⅛-in. discarded hoisting cable. In this case the old mine rails are placed at right angles to the plane of the shaft at intervals of about 3 ft. and the ⅜-in. strands of rope thrown into the forms in sets of three not over 12 in. apart vertically. The rails must not touch the ground or they are likely to take more than their share of the weight and crack the concrete. Before any of these pillars are put in, the loose rock is picked off the foot wall and the ground washed down so as to insure a good tight bond between the concrete and the solid rock of the foot wall.

The skip tracks at the Wolverine mine are close together, the manway being carried along the side of the shaft instead of in the center as is the practice in some of the Lake Superior incline shafts. For this reason, there is room for pillars only 12 in. wide, as they must be put in without interfering with the hoisting. On the side next the manway, the pillar is made somewhat wider.

Pillars and Beams Support Floor

Resting on these pillars and the foot wall, the floor beams of the station are put in. To insure that they will not be injured by the skip's catching on them, they are made 12x22 in. in cross-section. Fig. 3 shows in general the manner of reinforcing these beams. The upper part is reinforced by two mine rails and five pieces of old 1⅛-in. hoisting cable are used in the bottom. Three of the ropes are turned up at an angle of 45° near their ends, and when passing over a support, in order to help the concrete in resisting shearing stresses. To increase the bond between the concrete and the ropes, the latter are allowed to fray at the ends. One of these beams lies between the two skip compartments, one between the manway and the adjacent skip compartment, and the other next the wall of the outside skip compartment.

Columns and Beams Support Station Roof

The columns that support the roof beams are set over the pillars in the shaft. They are 12x18 in. in cross-section and are reinforced with triangular-mesh reinforcement, style 42. The roof beams which rest on these columns are reinforced in a similar manner to the floor beams, shown in Fig. 3, except that the rails are omitted. Transverse bracing beams are placed between the roof beams at the posts. They are 12x12 in. in cross-section; and are reinforced by three 1⅛-in. ropes, placed 1 in. from the under surface of the beam, the two outside ropes being turned up at an angle of 45° at the posts and ends to resist shearing stresses.

This whole structure is poured in place and care is taken to secure a good bond between the different members. A mixture of 1:2:4 is used, the rock being trap from the mine. It is crushed in rolls to 2-in. size and used without screening. The reinforcement is placed in the beams and pillars so that 1% of the beam area will be iron.

Where wire rope is used, it is assumed to have half the strength of a bar of the same diameter and proper allowance is made for this in the area computations of the reinforcement requirements.

Small Shapes Made on Surface

The concrete filling pieces are made 6x6 in. in section and from 7 to 8 ft. long, being reinforced with six ⅜-in. strands of old hoisting cable. These filling pieces, as well as the posts, caps and lagging slabs used in the crosscuts to the lode are made in forms on the surface. In all these a mixture of 1:2:4 is used, and they are permitted to set and season at least a month on the surface before being sent into the mine. The posts of the drift sets are made 6x6 in. in cross-section and are 6 ft. long. They are reinforced by four ½-in. bars, which are held in the proper position with regard to one another by wrapping with ¼-in. rodding. The caps are made 6x8 in. in cross-section, and 6 ft. long, reinforced with three pieces of 1⅛-in. cable. The lagging slabs are 3x12 in. in cross-section and 4 ft. long. A strip of triangular-mesh reinforcement, 2 meshes wide, is used in reinforcing them.

The ground in which these concrete sets are used is heavy, due to the cracking of the brow between the lode and the crosscuts, which, as originally driven, was considerably larger than at present. The weight, however, is a regular one, and not so trying as that encountered in swelling ground. The sets are not cracking to any extent, and the lagging is standing well, bending slightly but without even showing hairline cracks.

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Rand Mining Policies

SPECIAL CORRESPONDENCE

There is evidence that Rand mining methods have undergone some change during the last 12 months, and that the policy of milling large tonnages has been to some extent displaced by selective mining. To better illustrate the position, the accompanying table is given, showing the Rand results of the last few years as published by the Transvaal Chamber of Mines.

Year	Sorting per Cent.	Stamps	Tubes	Tons Milled	Stamp Duty Tons	Yield per Ton s. d.	Cost per Ton s. d.	Profit per Ton s. d.
1908	15.50	8591	89	18,196,586	6.27	31 5	18 0	13 5
1909	14.45	9158	134	20,543,759	6.79	28 7	17 1	11 6
1910	13.64	9205	170	21,432,541	7.19	28 1	17 7	10 6
1911	13.01	9432	216	23,888,258	7.88	27 7	18 0	9 7
1912	12.57	9449	262	25,486,361	8.39	29 0	18 8	10 4

A striking feature of these figures is the improvement in yield and profit per ton for 1912, as compared with the preceding year, after a constant decline in both for the preceding four years, the most difficult to account for satisfactorily being the higher yield. That it was not due to closer sorting the figures show, as the percentage of waste rock sorted out was less in 1912 than during any of the previous years. Nor can it be said to be due to any general improvement in the content of the reefs, for throughout the history of the Rand the average grade of ore sent to the mills has constantly declined. Moreover, several of the richest mines are becoming exhausted. With such a constant decline in the yield, and a similar increase year by year in working costs, the outlook for Rand mining has not been rosy, and if by any reasonable means the situation could be improved, it was plainly the duty of those in charge to do so.

Five years ago the outcry was all for lower costs, and for a brief period the efforts to secure them were successful. Since 1909, however, largely as a result of the repatriation of the Chinese, native labor has been scarce and expensive; white labor, owing to the phthisis scourge, has been more inefficient and legislative burdens have increased, making costs advance from 17s. 1d. in 1909 to 18s. 8d. per ton last year. It was with the object of reducing costs, and thereby increasing profits, that the merging policy was inaugurated, but figures show that in neither has success been achieved.

In furtherance of it, larger mills and heavier stamps were introduced on these fields, the average stamp duty having increased from 6.27 tons per stamp per 24 hours to 8.39 tons last year. For this increase in average stamp duty, the introduction of tube mills has been largely responsible and today examples are increasing, where 150 stamps and 10 tube mills are handling the same amount of ore that required 300 stamps six years ago. Naturally with such a marked increase in tonnage milled by individual mines, a reduction in the average cost per ton ought to be realized, and the fact that anticipations in this respect are not fulfilled needs, perhaps, some explanation.

Last year's figures appear to indicate that all attempts to reduce working costs having failed, the experiment of cleaner mining, accompanied where possible by selective mining, with the object of increasing the yield and profit, is being tried. Only partial success seems to have resulted from the adoption of this policy, due principally to its reduced output, thereby increasing the costs, which, as a rule, absorb most of the advantage gained in higher yield. That increased attention is being given to this new phase of Rand mining, is shown by the fact that the Consolidated Goldfields of South Africa has sent its consulting engineer to the Rand at the wish of some of the shareholders, to advise upon its adoption at the mines under the control of that group. A striking illustration of the unsuitability of the new policy for such a low-grade mine as the Simmer Deep, belonging to this group, was given by the chairman of that company, at the recent annual meeting of shareholders. He explained that out of a million and a half tons of payable ore developed in the mine, of an average assay of 4.2 dwt. per ton, only 6% of the total would exceed 4.7 dwt., so that this new policy of selective mining was quite unsuited to the conditions prevailing at the Simmer Deep. The chairman did, however, explain that at this particular mine past records proved that large-scale operations reduced the working cost and thereby added to the profit. The company hoped to pursue this policy in the future, its adoption having been precluded in the past by the scarcity of native labor, and want of available working capital. The Simmer Deep would seem to be one of those mines on the Rand where this new policy of increasing the grade of the rock sent to the mill by selective mining cannot with any prospect of success be adopted. There are several mines on the Rand, as well as in the same neighborhood, in exactly the same position. Several of these are deep mines, and underground conditions are being reached on the Rand, where picking and choosing of the reef to be worked cannot be adopted with so much success as formerly. As the mines grow in depth these conditions will become more pronounced, and will dominate the method of mining to as great an extent as the character and distribution of ore.

In the far east Rand more than in the central section, the unpayable areas are more extensive and easily defined. In the central Rand the gold contents, though varying, are more uniform in occurrence and do not fall so much below the level of payability. On the other hand, in the far east Rand, the proportion of payable reef embraces only from 40 to 60% of the ore exposed by development and it is under these conditions that most scope exists for the new mining policy to produce the best results. As a matter of fact it has been practiced lately in the far east Rand to a greater extent than elsewhere. In one large mine, the operations have been transferred from a barely payable area and concentrated in the richest section of the mine; in a neighboring mine, only the best areas are being stoped, the apparently unpayable areas being avoided by both development and stoping operations. The policy of the first example can only be justified when unavoidable, while the second has already brought its own retribution, in the shape of unequal movements of the hanging wall, and serious loss of profits. Both are detrimental to the future welfare of the mine

and are storing up immense tonnages of unpayable ore. There may be instances where the new policy may appear to be carried to the extreme, but no one will for a moment deny that on the far east Rand a prudent, selective mining policy is necessary. No one will deliberately mine unprofitable ore with the sole object of following a fixed system of mining, while under the Rand conditions it seems equally foolish to unnecessarily concentrate the stoping operations to the richest sections of the mine and thereby sacrifice profits capable of being earned under a saner working method.

The East Rand Proprietary mines last year illustrated in a striking manner what selective mining can do. With a quarter of a million tons less treated, as compared with 1910, the recovery was advanced 4s. 6d. per ton and the working costs, owing to the smaller tonnage treated, were increased 5s. per ton. The result was that profits were sixpence per ton less on the average, while the aggregate profits fell to the extent of £209,000. Another striking result of increasing the grade and costs at the East Rand Proprietary mines was to add four million tons to the already heavy accumulation of unpayable ore in the mine, which, under the old mining policy, was regarded as payable. Now this East Rand company is fairly typical of an average Rand mining company, for here good areas alternate with poor ones. Declining grade goes with depth, so that it will be interesting to see the period for which it will be deemed prudent to carry out the new policy, the permanent success of which is open to so much doubt. If it cannot succeed in this instance, there are numerous others where, if applied to the same extent, it must result in similar failure.

From what has been said it will therefore appear that the improvement in last year's yield was mainly due to this new mining policy. Rand gold mining admittedly differs from quartz mining, and each mine has to be handled according to its merits and underground conditions. As the mines grow in depth the grades fall, mining troubles increase, and the time is fast approaching when the best policy for each and every mine will need careful consideration.

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The Iron Mining Industry

According to statistics of the Department of Commerce, the total number of iron mines in the United States in 1909 was 483. The number of persons engaged in the industry on Dec. 15, 1909, or nearest representative date, was 55,176, of whom 52,230 were wage earners. The expenses of operation and development amounted to $74,071,830 per year, of which the payment for salaries and wages constituted somewhat less than one-half. The production of crude-iron ore was 51,947,129 tons for the year. Some of the ore produced in New York state is concentrated at the mines, and the net production, after concentration, for the country as a whole, was 51,717,920 tons. The quantity used for blast furnaces at the mines or shipped from the mines for use in affiliated blast furnaces or for sale were 50,521,208 tons, and its value at the mine was $106,539,574.

Manganiferous ore and other byproducts to the value of $407,508 were produced, making the total value of products $106,947,082. The value of iron ore produced in other industries such as gold and silver, limestone quarries, brick and tile manufacturing in 1909 was reported as $175,965, which, added to the net value of ore at the iron mines, gives a total value of iron ore for 1909 amounting to $106,715,539.

The Lake Superior district, comprising Minnesota, Wisconsin and Michigan and the Southern district, which comprises Alabama, Georgia and Tennessee, were the principal producing districts. The combined production of these two representing 91.9% of the total ore used by the operators in their own blast furnaces or sold in the market. The predominance of the Lake Superior district in the iron-mining industry is shown conspicuously.

Minnesota led in output of iron ore with a production of 28,214,713 tons. Michigan was second with 11,924,955 tons and Alabama third with 4,312,360 tons. New York and Wisconsin follow in the order named, with 1,024,173 and 1,002,666 tons, respectively. Other scattering states produced 3,902,901 tons.

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The Census Bureau

WASHINGTON CORRESPONDENCE

Very severe criticism is being visited upon the Census Bureau because of the unsuccessful outcome of the work of the office during the census-taking process which has just closed. Much of this criticism is being brought to the attention of the administration and is causing the leaders of the present government considerable serious thought as they realize that conditions in the office are now in a somewhat demoralized state and that they will be very severely judged if they do not introduce some means for rectifying the situation. As yet the new director has not appeared to be inclined to do anything of a material character toward changing the nature of the situation in the office.

One of the criticisms which has been brought strongly to the attention of the administration is an article in the *Journal of Political Economy*, in which the whole census situation is surveyed, and specially severe criticism is visited upon the portion of the census which deals with mining. This is described as being substantially worthless. In summing up the article in question says:

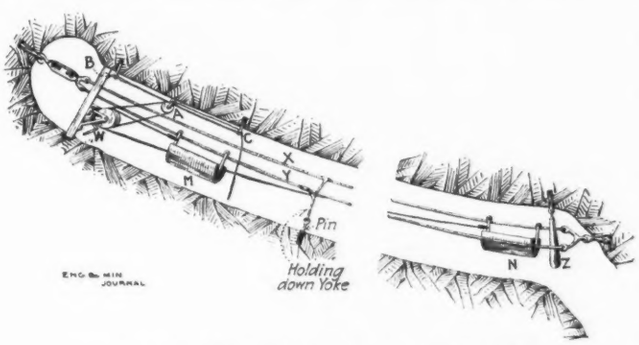
> What will be considered by many persons the breakdown of the census of 1910 is the more regrettable because it undoubtedly deals a serious blow to the movement for a scientific and permanent Census Bureau. The principal argument that has been urged in past years in behalf of the placing of the census upon a permanent basis has been the fact that thereby efficiency, speed and technical capacity would be advanced and the decennial renewal of a purely political, slow and incapable force would be avoided. The argument in favor of putting a scientifically educated student of economics in charge of the bureau has been that by so doing statistical methods and administrative management would be improved, the tone and the personnel of the undertaking would be raised, and the general conditions under which the work would be carried on would be improved. Experience has furnished some ground for the belief that nothing has been gained in personnel, while there has been actual retrogression in the matter of speed and real efficiency and probably in the technical value of the figures themselves. The latter point, as has been elsewhere noted, may possibly be considered, in a measure, still open to question, if viewed from a long-range standpoint. From a closer point of view it is certainly the case that the figures for the census as now presented are less available for immediate use and less closely comparable with those of former years than has been the case during any census of recent decades. Believing this, members of Congress and others vested with authority will almost inevitably be disposed to discriminate against the idea of the permanent scientific bureau and to do what they can in favor of the restoration of the old conditions. The trend of the reaction is already observable in the substitution of a political appointee for a statistically trained man in charge of the bureau.

DETAILS OF PRACTICAL MINING

Improvement in Underground Trolley Conveyors

By E. M. Weston*

One defect of the aërial rope automatic bucket conveyors in use in inclined stopes on the Rand is that unless the haulage ropes be wound on separate clutched drums and have power devices to wind and unwind and thus shorten or lengthen the ropes, the buckets can load from one place in the stope only. To avoid this, Herbert Krause, underground manager of the New Kleinfontein mine, invented the conveyor shown in the accompanying sketch. It is really an adaptation of the Whiting hoist principle underground, and is not patented. The sketch explains itself. *X* and *Y* are the main ropes stretched parallel from top to bottom of the slope. *Z* is a swinging stop block to take up any shock. *M* and *N* are two side-tipping, long, shallow trucks of any convenient size, usually 4 to 10 cu.ft. capacity. *O* is the haulage rope which passes around the two grooved truck wheels *W*, and over



Adjustable Overhead Gravity Stope Tram

a pulley *A* which is made to traverse along another rope *BC*, so that working length of *O* in the stope is varied. This gear can work in a stope as low as 45 in. and on a dip of 15 to 35 degrees.

*Union Club, Johannesburg, South Africa.

Long Distance Measurements with Stadia

It frequently happens in surveying practice that it becomes necessary to take a reading across a body of water or across a gulch, which need not be extremely accurate, and to obtain which by taping would be difficult or impossible. It is not always realized, says the *Canadian Engineer*, July 17, 1913, how great a distance may be read in this manner by the stadia method. The ordinary 13-ft. rod will, of course, give approximately a reading of 1300 ft. By using only one-half the stadia interval, that is, from the center wire to the top or bottom wire of the telescope, this maximum reading can be increased to 2600 ft. A still greater increase can be had by using some natural object as part of the stadia rod, for instance, by setting a target at the bottom of a stump, holding the rod on top of the stump and measuring from the target to a point high on the rod. In such case, of course, the rod man must measure the distance from the target to the top of the stump. When using only half the stadia interval, care must be taken that it is an exact half of the full interval or a proper allowance be made. By using natural objects in this way, distances of 4000 ft. have been measured. It is not advisable to go much beyond this interval, however, since with an ordinary telescope it will be difficult to distinguish target and rod.

Safety Rules—Steam Shovels*

(1) Seamless tubing should be used in all boilers.

(2) Guards should be placed around water-gage glasses.

(3) A blue light should be provided at the rear end of the boiler.

(4) All gears, setscrews and crankshafts should be covered.

(5) Steps should be provided for getting on the running board.

(6) The running board should be railed.

(7) Ladder and hand rails should lead to the sheaves at the point of the boom.

(8) The hoisting chain at the foot of the boom should be guarded.

(9) A proper signal should be given before a steam shovel is moved on its track.

(10) Steam-shovel engineers should make a daily inspection of the machine under their charge and of all the cables and chains on their shovels, and report defects immediately to the master mechanic.

(11) See that ladders, footboards, hand holds, running boards and steps are kept in constant repair and free from cans, grease, snow and ice.

(12) No person whose duty does not require it should be permitted on steam shovels.

(13) No gasoline should be kept inside of a steam shovel.

(14) No person should be allowed near any car being loaded at a pocket or by a steam shovel. Warning is given that chunks of ore frequently roll over the side of cars being loaded and it is an extremely dangerous practice to be around or near the same at such times.

(15) Stripping banks alongside steam shovels and wherever men are at work should be trimmed down of all loose material. Bank trimmers should notify men working below them. Men should not stand behind the shovel.

(16) Proper care should be taken to prevent trestle legs from falling and injuring workmen.

(17) Keep away from in front of the shovel to avoid

*From Inland Steel Co.'s book of rules.

crushing between dipper and truck; do not attempt to pass under the dipper.

(18) Chain or block steam shovel and cars when set on grade and apply the car brakes.

(19) Short whistle blasts on steam shovels and locomotive engines should signify, "Look Out for Blast." Two long whistles should signify that blasting is over and work may be resumed.

(20) Care should be taken to keep black powder well covered when charging holes in open pits and to leave none scattered around the holes. Sparks from locomotives or steam shovels may cause an explosion.

(21) Men dumping stripping cars should step back as soon as toggle-chains are knocked off and cars dumped.

(22) Shovels under steam should not be left without a competent man in charge.

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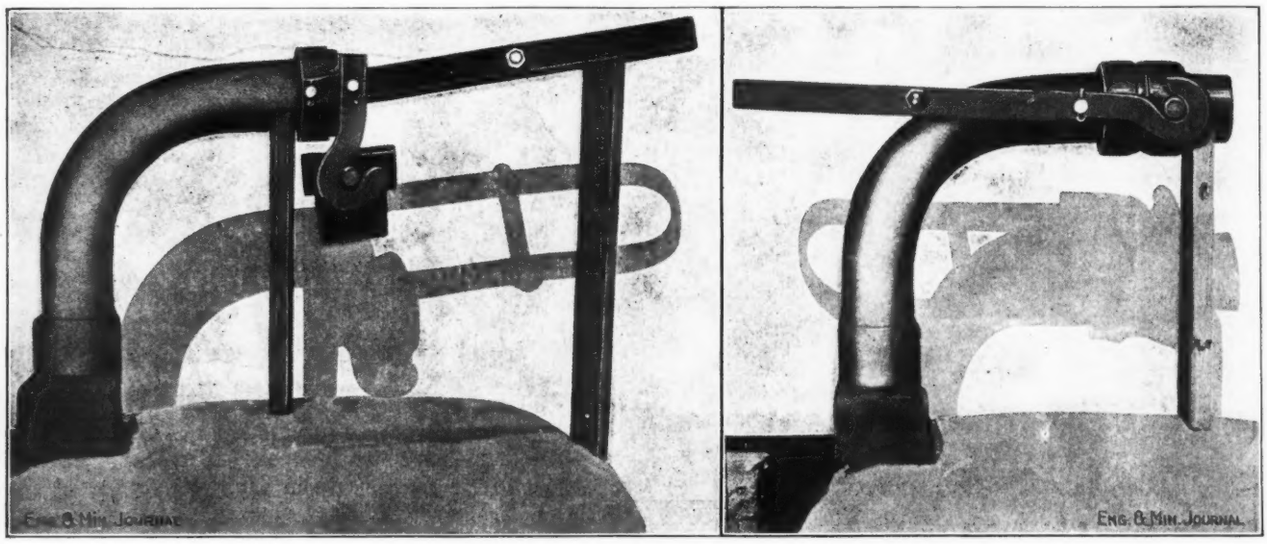
Rapid-Acting Pump Suction Joint

The accompanying illustrations show a special 3-in. joint for use on sinking-pump suctions. It was invented and constructed at the Springs Mines on the Rand. Its operation is so simple as to need no description, the joint being opened and the suction disconnected by simply throwing the lever. In sinking two shafts, according to B. D. Bushell (*Bull.* 104, I. M. M.), so heavy a flow of water was encountered as to make it necessary to keep the sinking pumps in operation up to the last possible minute before blasting. The use of the joint aided greatly in this.



Suction Joint for Sinking Pump

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Sod-Calked Ditches

On the Seward Peninsula, Alaska, ditches through rock section are stopped against leakage, in many instances, by the use of sod. The peculiarly tough and tenacious sod, which is abundant in many places in the North (Water Supply Paper No. 314, U. S. Geol. Surv.), is cut with mattocks into pieces one or two feet square and placed bottom up in the ditch to be stopped. Two layers are usually so placed, with joints broken as well as possible, and the whole bed carefully tamped. The sides are made tight with a sod wall consisting of pieces laid one above the other, bottom up. Above the waterline the grass continues to grow and binds the material more closely and firmly with its roots. The best sod contains grass roots and little moss, the latter being less tenacious and more readily decaying; but where this cannot be obtained, sod of inferior quality has to be employed.

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Stoping Methods, Mount Lyell

As the result of several serious accidents at the Mount Lyell mines, A. Montgomery, state mining engineer of Western Australia, was requested by the Tasmanian government to inspect the mine workings and report on their safety. His rather favorable report, embodied in the semiannual report of the Mount Lyell Mining & Ry. Co., Ltd., gives an excellent and interesting description of the stoping methods employed in the Mount Lyell mine proper.

The orebody is a huge chimney of cupriferous iron pyrites, giving an irregular oval shape in horizontal sections; it has been followed down for over 800 ft. from the surface. With the exception of some schist inclusions, the orebody is remarkably homogeneous, consisting of pure fine-grained pyrites. On the No. 6 level it is over 400 ft. long and up to 250 ft. wide, varying somewhat from these dimensions at other points.

The mining method adopted has been to determine the size and shape of the orebody at each level by drifting through and around it and then to lay out a systematic scheme of working each block between levels by cutting it up into sections divided by 25-ft. pillars of solid ore, the pillars so disposed as to form a continuous support from the bottom of the mine to the opencut on the surface. There is one main longitudinal pillar and two transverse ones with several smaller detached pillars left where the ground appears to require more support. On the Nos. 6 and 7 levels there are five principal stopes or sections divided from one another by the main pillar system, and on the No. 8, there are three such sections, inasmuch as the orebody there is smaller. Each section has a main drift with crossdrifts at right angles, running

to the circumscribing pillars or to the walls, as the case may be. The crossdrifts are usually three sets or 21 ft. apart, and all drifts are timbered with strong square-sets, approximately cubical and measuring 7 ft. in each dimension. The sills of the sets are laid on heavy lagging 15 ft. long and running from 8 to 10 in. in diameter. The object of this is to permit the floor to be picked up easily when it is reached by a stope from below. The posts of the sill square-sets are extremely heavy, being often from 2 to 2½ ft. in diameter, since for a while they have to carry a considerable weight of filling.

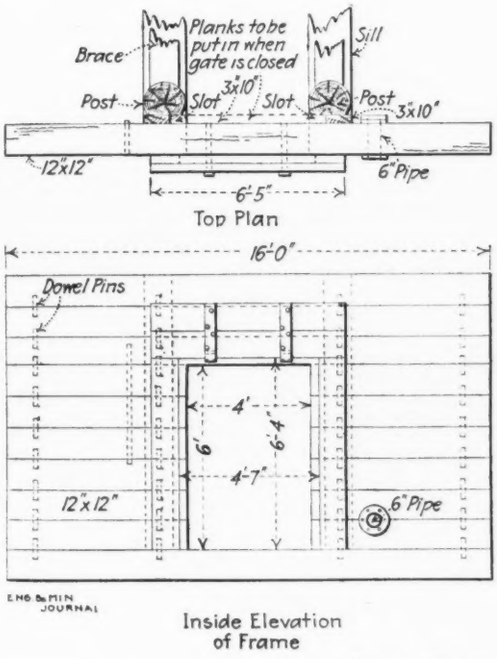
When the sill floor has been completely stoped by the square-set method, as many as possible of the sets between the drifts are filled. Meanwhile one or more filling chutes have been made by raising to the level above or by winzing down. These chutes are connected through to the surface opencut, from which the filling is obtained. Overhand stoping is now begun, the work being carried so as to preserve a dome-shaped roof corresponding to the cone of filling, which forms naturally as the filling comes from the chutes. Stoping proceeds by alternately breaking down and removing the ore and running in the filling to take its place. Most of the holes drilled are water holes, and a complete water service is maintained throughout the mine, each drill being supplied with a hose and spraying jet in order to reduce the amount of dust.

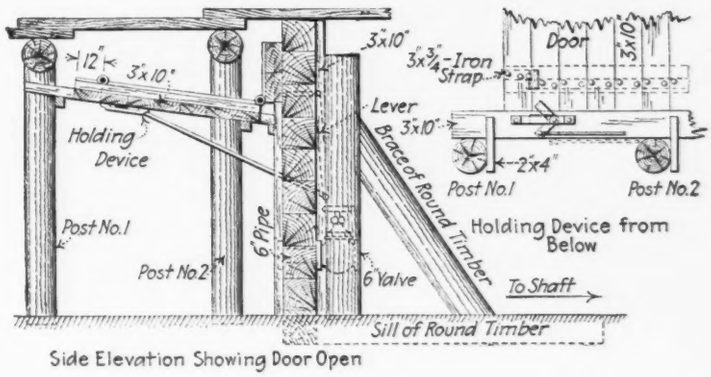
The manner of carrying the stopes with a domed back makes it possible to preserve the strongest form of roof. As the stoping proceeds upward, the load of the filling is largely removed from the sill sets, since they are all filled between drifts.

There are usually four manways in each main stope, one near each corner, but in addition numerous ore chutes are maintained through the filling, these being rarely more than 20 ft. apart. Handling the ore is, therefore, simple, since it can be easily moved down hill on the surface of the filling to the nearest chute. When the broken ore has been removed, the passes are built up nearly or quite to the back, leaving only enough space for a man to crawl through. This gives enough room for the next layer of ore to fall freely.

The filling is run in, mixed with enough water to make it much resemble rather wet concrete in consistency. Timber chutes are erected to various parts of the stope so that it can be run with little shovelling at fairly flat angles if desired. Since this filling sets so hard as to require a pick to break it and subsides only a little after being put in, it is extremely strong.

The ore is firm and strong and the arched backs need little support, but where they show a tendency to slab off, they are suported with timber stacks; or, if a considerable area of bad ground is encountered, square-sets are resorted to. These timber supports are allowed to be buried in the filling.





DRIFT BULKHEAD AND GATE FOR FLOOD CONTROL

Safety Flood Gates

The Bangor mine, on the Mesabi Range, is one of the properties of that district opened and operated in the face of extremely difficult and harassing conditions. The orebody is overlaid by quicksands and water-bearing formations. In mining by the slicing system, these materials were often permitted by the caving to enter the mine workings and their control was a serious problem. Flows of fine sand which resembles clay and is impervious to water, occurred with great suddenness, and to limit them to immediately adjacent portions of the mine and prevent their filling the whole drift and even the shaft bottom, the drifts were equipped at intervals with safety flood gates, of the design shown in the accompanying illustrations, taken from "Iron Mining in Minnesota," by Charles E. van Barneveld.

The gates are designed to open toward the face of the drift, that is, away from the shaft. They are normally held open by a trigger device, which can be released by the last man of the crew making his escape. In case the bottom of the drift is already partly filled with débris, the bottom 12 in. of the gate is hinged so that the main part of the gate can be shut to cover the obstructing material.

The construction of the bulkhead frame and the door itself is not extremely heavy, as their purpose is not so much to withstand a permanent and high head as to stop quickly a rapid horizontal rush of sand and water.

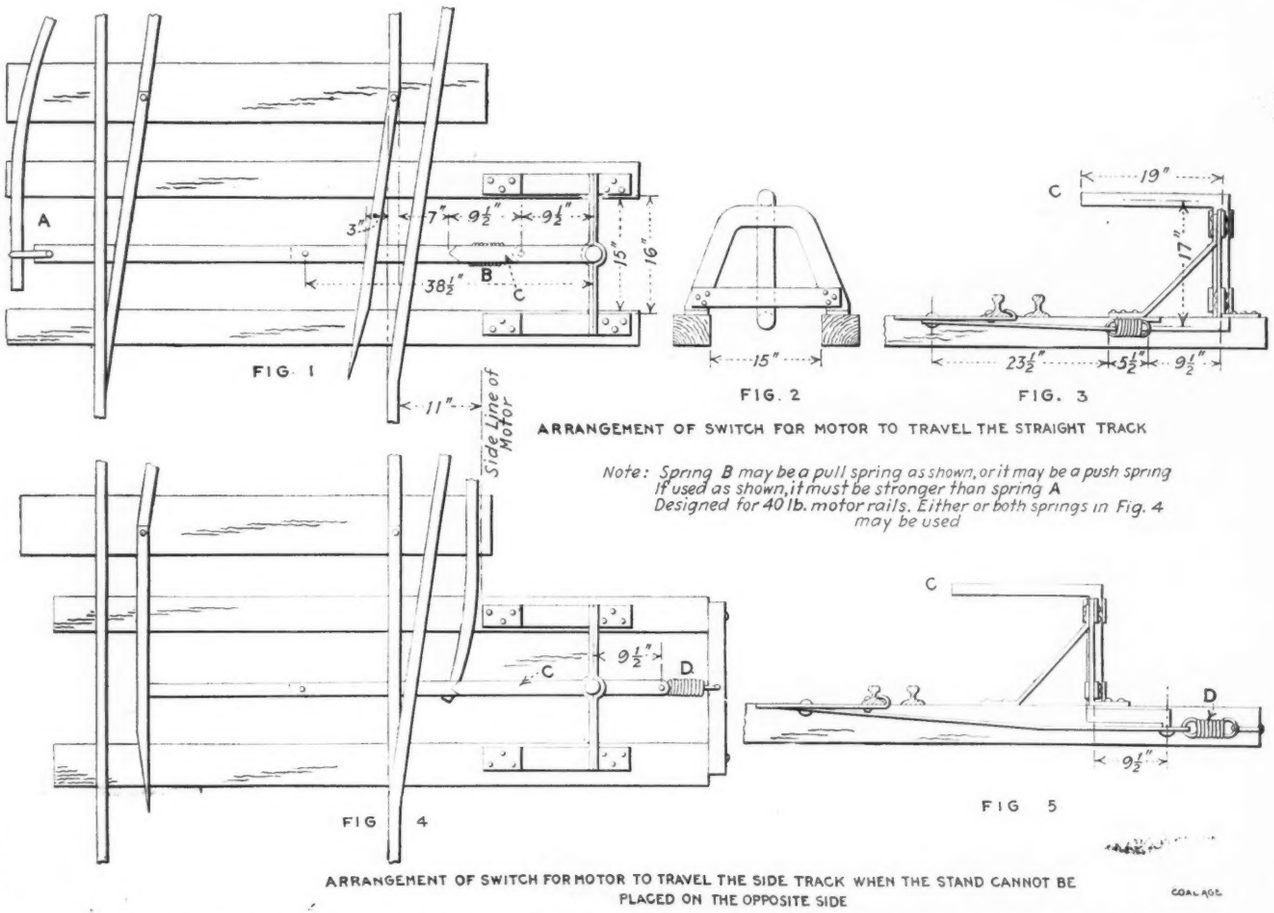
Usually, when a sand rush is feared, a safety man is stationed at each controlling gate, whose duty it is to see that all hands are passed through and to close the gate. A contemplated improvement involves an opening near the top with a hinged flap, so that a man might pass through a closed gate with several feet of sand behind it.

❋

Automatic Switch for Locomotive Haulage

The automatic mine switch shown herewith is designed for use with trains of mine cars drawn by a locomotive, where it is desired to send the cars on one track and the locomotive on another. The switch, as described by J. E. Jones in *Coal Age*, July 26, 1913, is thrown and maintained in one position by the side of the locomotive pressing against the switch lever; as soon as the locomotive passes, a spring returns the switch points to their normal position and the following train is sent to a different track from that taken by the locomotive. The lever *C*, which is caught and pushed over by the locomotive side, has a vertical portion carried in bearings in a standard. It is bent again to form a horizontal arm below the bearings, and this portion, acting as a crank, pulls over or pushes over the switch points by means of a connecting rod to the bridle. In Figs. 1, 2 and 3, the arrangement is such that the locomotive pulls the points over and takes the straight track. The latch spring *A* pulls them back to the position shown when the locomotive has passed, the small, coiled spring being inserted only to take up shock. In Figs. 4 and 5, the device is shown arranged to push the points over and allow the locomotive to take the right-hand track. The returning spring *D* in this case is of the coil type.

The switch must be exactly designed for specific conditions. The dimensions shown herewith, of a switch in use with a Whitcomb gasoline locomotive, are suitable for a track of 38-in. gage.



AUTOMATIC DEVICE FOR ELIMINATING FLYING SWITCHES IN MINE LOCOMOTIVE HAULAGE SYSTEMS

❋

Permissible Radii for Pipe Bends

The accompanying table from the National Tube Co.'s Book of Standards, gives the advisable radius and the minimum radius to which pipe of standard thickness may be bent.

TABLE OF RADII FOR WROUGHT-PIPE BENDS

Size of Pipe In.	Advisable Radius, In.	Minimum Radius, In.	Size of Pipe In.	Advisable Radius, In.	Minimum Radius, In.
2½	15	10	10	60	40
3	18	12	11	66	44
3½	21	14	12	72	48
4	24	16	13	84	60
4½	27	18	14	90	68
5	30	20	15	100	76
6	36	24	18 O.D.	125	90
7	42	28	20 O.D.	150	120
8	48	32	22 O.D.	165	132
9	54	36	24 O.D.	180	144

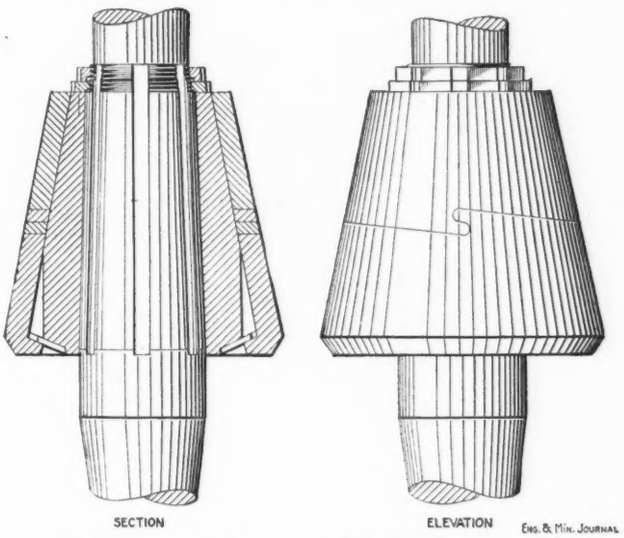
❋

The Straight-Sided Sinking Bucket is preferred to the barrel-shaped bucket or the bucket wider at the top in Butte (A. I. M. E. Bull., August, 1913), since without a wide bottom a bucket will not rest steady on the muck.

DETAILS OF METALLURGICAL PRACTICE

Head for Gyratory Crushers

Rock crushers of the Gates type have a conical head by means of which the breaking is accomplished, the head having an eccentric motion which allows pieces of rock to get in between the head and the walls of the machine, and breaks them when the eccentric motion reduces the size of the opening. Wear of this conical head is uneven and is principally on the lower half, so that the upper half may be still useful when the lower half is worn out. In order to avoid this wasteful condition, U. S. patent No. 1,066,277 has been granted to D. G. Hunter and T. G. Murton, of Germiston, Transvaal, S. A., for a conical crushing head divided into two or more parts, any of which may be taken out and replaced



Removable Head for Gyratory Crusher

without the necessity of discarding the others. As shown in the accompanying drawing, the head is divided into two or more parts by a spiral division, it being thus possible to put them together and lock them in such position readily and still have them available for replacement at any time. The drawing shows a two-part head.

Cleaning Elevator Buckets

Elevator buckets handling damp ore containing a percentage of fine material, sometimes find difficulty in discharging the fine portion, which tends to pack in the bottom of the bucket. To avoid this difficulty, the operators at the New Reliance mill, Trojan, S. D., have devised an arrangement, described by H. C. Parmlee, in *Metallurgical and Chemical Engineering*, Aug., 1913. A plate of sheet iron is fitted loosely into the bottom of each bucket, and two bolts, passing through amply large holes in the bucket bottom, are rivetted to it. The plate has a movement of about 1 in. In discharging the load, the plate falls and the movement and jar cleans the bucket.

Power Consumption in Bearings

A series of tests was made in factories driven by electric motors to determine the power consumed in bearings. The power required to drive the motors with different loadings could be accurately measured and by subtraction, the power absorbed by the line shafting obtained. The results are given by C. A. Graves, under whose direction the tests were made (*Amer. Mach.*, June 5, 1913).

In obtaining the data, ammeters and voltmeters were used to measure the power of direct-current motors, and wattmeters for alternating-current motors. The testers were instructed to count the hangers in which the shafting revolved, and also the loose pulleys on the shafting and countershafting over which the belts were passing. Then all work was stopped on the various machines and the amount of power input into the motor was measured. All the belts were then removed from the shafting and countershafting, one at a time, and readings taken of the amount of power input into the motor after each belt was removed, until only the motor driving-belt remained. The motor driving-belt was then removed, and the amount of power required to drive the motor free measured. In many instances, the belts were replaced in reverse order to check the results.

The difference between the amount of power required with the belts on and the amount required where the motor was running free, represents the amount of power absorbed by the bearings, subject to a slight correction due to the efficiency of the motor at various loads. Under these conditions of test, however, the extra tension on one side of the belt when operating a machine, and consequently the increased friction on the bearing, is not measured. This amounts to approximately 20%, but as this increased friction is due to work done, and occurs only when the machine is operating, it is not considered in this article.

Referring to the classifying of a hanger and a loose pulley together as a bearing, it was found that the average loose pulley, either on a shaft or countershaft, absorbed nearly as much power as a hanger, and in some cases it was found that nearly twice as much power was used by a loose pulley as an adjacent bearing on the same shaft. Therefore, as the tests progressed, because there was so slight a difference between these two, both were classed as bearings, and they were counted together.

The results of these tests show that the average shafting in the stone-working industries uses the largest amount of power and this is due to lack of care in keeping the shafting in alignment and also to dusty, gritty surroundings. In this line of business, on the average, a horsepower would be absorbed by approximately five bearings. In machine-shop practice, cases of excessive friction were found which were due to lack of lubrication, but in the average shop the shafting losses per bearing were not excessive, although in a great many cases the total loss because of excessive bearings was more than neces-

sary. In the various industries the average bearings absorb approximately 0.12 of a horsepower each. This means that 100 bearings will use 12 hp. in friction during every hour of operation. Few realize what a saving can be effected by a little attention given to this subject; for instance, the operation of an extra length or two of shafting just because it might be used some time, may mean a waste of 1000-hp.-hr. per year.

The data were classified in order to observe the effect of the size of the shafting, as shown in Table I. The smaller fraction diameters are classified under the nearest simple fraction. For example, 2-in. diameter includes sizes between $1\frac{5}{16}$ in. and $2\frac{1}{8}$ inches.

TABLE I. BEARING FRICTION OF VARIOUS SIZES OF LINE SHAFTING

No. of bearings	Size of shaft	Average r.p.m.	Maximum hp. per bearing	Minimum hp. per bearing	Average hp. per bearing
66	$\frac{15}{16}$ in.-1	428	0.052	0.010	0.036
706	$1\frac{1}{8}$ in.	382	0.079	0.016	0.033
37	$1\frac{1}{4}$ in.	425	0.119	0.040	0.062
492	$1\frac{1}{2}$ in.	392	0.193	0.035	0.089
155	$1\frac{3}{4}$ in.	218	0.113	0.029	0.078
409	2 in.	242	0.300	0.028	0.133
21	$2\frac{1}{4}$ in.	264	0.321	0.124	0.257
83	$2\frac{1}{2}$ in.	243	0.300	0.085	0.255

A test was made in a factory with a complete equipment of Hyatt roller bearings and the result of the test on the eight separate shafts is given in detail in Table II.

TABLE II. FRICTION OF HYATT ROLLER LINE SHAFT BEARINGS

Section of shaft..	1	2	3	4	5	6	7	8
Number of hangers.....	22	7	11	7	7	7	7	8
Number of loose pulleys.....	40	24	20	19	5	8	2	22
Total bearings...	62	31	31	26	12	15	9	30
Horsepower to drive shafting..	1.716	0.858	0.724	0.804	0.288	0.549	0.281	0.938
Horsepower for bearing.....	0.027	0.028	0.026	0.031	0.024	0.036	0.031	0.031
R.p.m. shafting..	275	300	300	200	275	200	240	180
Diameter shafting.....	2 in.	2 in.	2 in.	$1\frac{15}{16}$ in.	$1\frac{15}{16}$ in.	$1\frac{15}{16}$ in.	$1\frac{15}{16}$ in.	$1\frac{15}{16}$ in.

The average friction loss of these 216 bearings amounts to 0.0286 hp. By comparing this loss with the losses of 2-in. babbitted bearings it will be noted that there is a reduction of approximately $^1/_{10}$ hp. per bearing by the use of roller bearings. What the reduction in power will save in dollars and cents, however, must be taken up separately for each installation.

⁂

Cottrell's Filtering Medium for Bag Houses

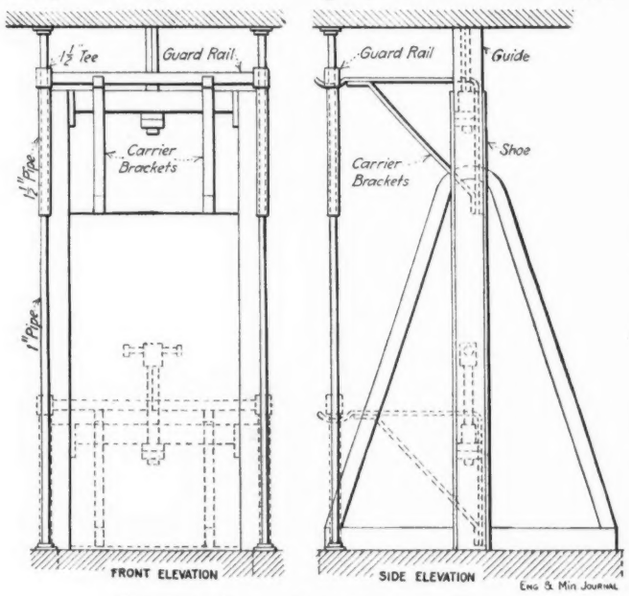
The corrosion of ordinary woven fabrics by converter and roaster gases is a well known phenomenon. F. G. Cottrell, of Berkeley, Calif., has patented a process to avoid this (U. S. pat. 1,060,065). His experiments have shown that if any sort of cloth be heated out of contact with air, it commences to decompose at between 150 and 200° C. During this partial carbonization there is a decrease in tensile strength, and an increase in brittleness, but with care, a fabric can be produced which will still have sufficient strength to act as a filter, and yet will be resistant to acid. As an example, samples of cotton cloth weighing 350 grams per square meter, and having a tensile strength of 2300 kg. per m., were heated to from 300 to 340° C. for periods of 10 min. to three hours. During the treatment they lost 68 to 76% of their weight, and at the end had tensile strengths of 30 to 85 kg. per m. On boiling with sulphuric acid, they were found to be completely resistant to acid of 50 to 64% strength.

In general, it may be said that the higher the temperatures used, the shorter the time of exposure necessary. A few minutes' heating between 300 and 350° C. is equivalent to several days or a week between 200 and 250° C. Mr. Cottrell prefers to take bags or tubes woven in one piece, as in the ordinary bag-house construction, and in this form submit them to this charring process. After this heat treatment, the fabric will no longer burn with flame, but will only char or smoulder slowly.

⁂

Safety Gate

In the cyanide plant of the Alaska-Treadwell company a lift is installed with a safety gate. As illustrated, the gate proper consists of a horizontal top piece made of 1½-in. pipe with two vertical pieces of 1½-in. pipe which slide upon two guides of 1-in. pipe. The gate is actuated by a bracket attached to the lift. This bracket projects outward and the ends of its horizontal pieces engage the top bar of the gate, which is thus lifted



SLIDING GATE ACTUATED BY CAGE

along with the cage. It will be noted that the device is extremely simple, and, while it would have to be modified for the purpose, it should be applicable to the collar of a mine shaft.

⁂

Extracting Tin from Base Bullion

Extraction of tin from base or lead bullion forms the subject of U. S. patent No. 1,060,527, issued to B. C. Besley, of Howell, N. S. W.

The process consists of melting salt in an appropriate vessel, a crucible or reverberatory furnace, and introducing the lead bullion. The latter, solid or melted, sinks through the salt, preventing volatilization. Oxide of lead, preferably litharge, is thrown into the furnace, and after about half an hour the tin becomes associated with the lead oxide and leaves the molten lead. Tapping removes the molten lead carrying the silver and the tin-lead oxide is removed in lumps. The latter is smelted in a reducing atmosphere, producing a marketable lead-tin solder. When the process is carried out in crucibles or pots, the products are found in separate strata after cooling, and may be broken apart.

THE COST OF DOING THINGS

Yardage in Ditch Excavation

The accompanying table will be found very useful in expediting the preparation of estimates of yardages in ditch excavation. They are of exact application wherever the estimate is made from center cuts, without resort to cross-sectioning, which is common practice where the ground is fairly level. After the profile has been determined from levels taken over the center line in the field, and the grade of the bottom of the ditch fixed, it is a simple matter to determine the center cuts at 100-ft. intervals. Then the table can be entered directly for yardages, using the average of adjacent cuts. The tables give the yardages for 100 ft. of distance. If shorter or longer intervals are used they can still be made to apply by the application of the proper factor; thus if the interval used for 200 ft., the yardage will be twice that given; if 50 ft., the yardage will be one-half. The tables given apply to ditches having a bottom width of 2, 3 and 4 ft. respectively. Side slopes are taken at 1:1, the slope most commonly used.

DITCH 4′ WIDE AT BOTTOM, SIDE SLOPES 1 : 1, CUBIC YARDS IN 100′ FOR CENTER DEPTHS

Depth	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0		1.52	3.11	4.78	6.52	8.33	10.22	12.19	14.22	16.33
1	18.52	20.78	23.11	25.52	28.00	30.56	33.19	35.89	38.67	41.52
2	44.44	47.44	50.52	53.67	56.89	60.19	63.56	67.00	70.52	74.11
3	77.78	81.52	85.33	89.22	93.19	97.22	101.33	105.52	109.78	114.11
4	118.52	123.00	127.56	132.19	136.89	141.67	146.52	151.44	156.44	161.52
5	166.67	171.89	177.19	182.56	188.00	193.52	199.11	204.78	210.52	216.33
6	222.22	228.19	234.22	240.33	246.52	252.78	259.11	265.52	272.00	278.56
7	285.19	291.89	298.67	305.52	312.44	319.44	326.52	333.67	340.89	348.19
8	355.56	363.00	370.52	378.11	385.78	393.52	401.33	409.22	417.19	425.22
9	433.33	441.52	449.78	458.11	466.52	475.00	483.56	492.19	500.89	509.67
10	518.52	527.44	536.44	545.52	554.67	563.89	573.19	582.56	592.00	601.52
11	611.11	620.78	630.52	640.33	650.22	660.19	670.22	680.33	690.52	700.78
12	711.11	721.52	732.00	742.56	753.19	763.89	774.67	785.52	796.44	807.44
13	818.52	829.67	840.89	852.19	863.56	875.00	886.52	898.11	909.78	921.52
14	933.33	945.22	957.19	969.22	981.33	993.52	1005.78	1018.11	1030.52	1043.00
15	1055.56	1068.19	1080.89	1093.67	1106.52	1119.44	1132.44	1145.52	1158.67	1171.89

DITCH 2′ WIDE AT BOTTOM, SIDE SLOPES 1 : 1, CUBIC YARDS IN 100′ FOR CENTER DEPTHS

	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0		0.78	1.63	2.56	3.56	4.63	5.78	7.00	8.30	9.67
1	11.11	12.63	14.22	15.89	17.63	19.44	21.33	23.30	25.33	27.44
2	29.63	31.89	34.22	36.63	39.11	41.67	44.30	47.00	49.78	52.63
3	55.56	58.56	61.63	64.78	68.00	71.30	74.67	78.11	81.63	85.22
4	88.89	92.63	96.44	100.33	104.30	108.33	112.44	116.63	120.89	125.22
5	129.63	134.11	138.67	143.30	148.00	152.78	157.63	162.56	167.56	172.63
6	177.78	183.00	188.30	193.67	199.11	204.63	210.22	215.89	221.63	227.44
7	233.33	239.30	245.33	251.44	257.63	263.88	270.22	276.63	283.11	289.67
8	296.30	303.00	309.78	316.63	323.56	330.56	337.63	344.78	352.00	359.30
9	366.67	374.11	381.63	389.22	396.89	404.63	412.44	420.33	428.30	436.33
10	444.44	452.63	460.89	469.22	477.63	486.11	494.67	503.30	512.00	520.78
11	529.63	538.56	547.56	556.63	565.78	575.00	584.30	593.67	603.11	612.63
12	622.22	631.89	641.63	651.44	661.33	671.30	681.33	691.44	701.63	711.89
13	722.22	732.63	743.11	753.66	764.30	775.00	785.78	796.63	807.56	818.56
14	829.63	840.78	852.00	863.30	874.67	886.11	897.63	909.22	920.89	932.63
15	944.44	956.33	968.30	980.33	992.44	1004.63	1016.89	1029.22	1041.63	1054.17

DITCH 3′ WIDE AT BOTTOM, SIDE SLOPES 1 : 1, CUBIC YARDS IN 100′ FOR CENTER DEPTHS

	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0		1.15	2.37	3.67	5.04	6.48	8.00	9.59	11.26	13.00
1	14.81	16.70	18.67	20.70	22.81	25.00	27.26	29.59	32.00	34.48
2	37.04	39.67	42.37	45.15	48.00	50.93	53.93	57.00	60.15	63.37
3	66.67	70.04	73.48	77.00	80.59	84.26	88.00	91.81	95.70	99.67
4	103.70	107.81	112.00	116.26	120.59	125.00	129.48	134.04	138.67	143.37
5	148.15	153.00	157.93	162.93	168.00	173.15	178.37	183.67	189.04	194.48
6	200.00	205.59	211.26	217.00	222.81	228.70	234.67	240.70	246.81	253.00
7	259.26	265.59	272.00	278.48	285.04	291.67	298.37	305.15	312.00	318.93
8	325.93	333.00	340.15	347.37	354.67	362.04	369.48	377.00	384.59	392.26
9	400.00	407.81	415.70	423.67	431.70	439.81	448.00	456.26	464.59	473.00
10	481.48	490.04	498.67	507.37	516.15	525.00	533.93	542.93	552.00	561.15
11	570.37	579.67	589.04	598.48	608.00	617.59	627.26	637.00	646.81	656.70
12	666.67	676.70	686.81	697.00	707.26	717.59	728.00	738.48	749.04	759.67
13	770.37	781.15	792.00	802.93	813.93	825.00	836.15	847.37	858.67	870.04
14	881.48	893.00	904.59	916.26	928.00	939.81	951.70	963.67	975.70	987.81
15	1000.00	1012.26	1024.59	1037.00	1049.48	1062.04	1074.67	1087.37	1100.15	1113.00

The Waihi Gold Mining Co.

The annual report of the Waihi Gold Mining Co., Waihi, New Zealand, for the year ended Dec. 31, 1912, states that gold and silver sold during the year from 147,828 tons of ore treated amounted to $1,353,302. Gross profit amounted to $581,804, after crediting miscellaneous income. Income tax, expense of examining other mines, construction and depreciation not charged in operating account, amounted to $338,892. Dividends to the amount of $723,032 were paid during the period. Operations were suspended for the greater part of the year, on account of a strike called on May 13. During the time of the strike it was possible to mine only a limited tonnage. In 1911 the production was 350,699 tons, or more than double that of 1912. The total operating cost was apparently about $5.75 per ton of ore treated, consisting of: Stoping, development, pumping and general mine expense, $1.67; transporting ore to mill, 10c.; crushing ore through rock breakers, 10c.; milling, 47c.; cyaniding, 75c.; concentrate treatment, 10c.; refining, 13c.; repairs,

21c.; superintendence, etc., 14c.; the remainder of the cost being made up of office expenses, rents, taxes, directors' fees, etc. Of the cyaniding cost, about 46.5% was for cyanide and zinc. The company now operates its mine through four shafts, all approximately 1200 ft. deep, with the exception of No. 6, which is 1023 ft. Total development amounted to 7274 feet.

The reserves consisted of 750,634 tons of payable ore at Dec. 31, 1912; in addition to this there are 711,541 tons in arches and pillars, 54,114 tons broken in shrinkage stopes and 32,478 tons in stock on surface.

At the Waihi mill, operating 90 stamps and five tube mills, 36,888 tons of ore was crushed. The average number of stamps running was 70.073, representing a daily average of 4.83 tons per stamp. The proportion of ore treated as sand was 30.12%; as slime, 68.01%, and as concentrates, 1.87%. All concentrates from this mill are sent to the Victoria mill for treatment. The extraction was 91%, or 92.2% of gold and 84% of silver contents.

The Victoria mill operates 200 stamps and 11 tube mills; during the period it ran 172 days with an average of 126 stamps, and crushed 110,940 tons of ore. The stamp duty was 5.118. The standard screen used on the mortars was 10 mesh and the average number of tube mills running was 6.7. At this mill, 20.28% of the ore was treated as sand, 78.49% as slime and 1.23% as concentrate. The average extraction was 89.5%. At the concentrate treatment plant a 96% extraction is obtained at a cost of about $6.60 per ton. A summary of the two mills and concentrate plant shows an extraction of 92.2% of the gold and 77.6% of the silver contents, or a total of 89.7%. The average assay of the ore fed to mills was: Gold, 8 dwt. 12 gr.; silver 3 oz. 10 dwt. 22 gr. Including mine, mill and bullion samples, about one assay was run for every 24 tons of ore treated. The tube mills are operated at about 25 revolutions per minute.

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Underground Costs in Minnesota Iron Mining

The following data were taken from Bulletin No. 1 of the Minnesota School of Mines. In underground mining all regular breaking (drifting and stoping) is run on contract, a contract gang consists of four men, two on day and two on night shift. The contractors do their own breaking, timbering, mucking and local tramming. The tramming distance to the ore chutes where they deliver the ore to the company varies from 75 to 300 ft. Owing to the rise in the bedrock the ore sometimes has to be transferred in tramming. All contract prices are adjusted to meet the varying conditions. The contractor furnishes all supplies except timber which is delivered by the company to a convenient point. He also sets his own timber and lays his track. The usual list of tools consist of four picks, four augers (3½, 4, 6 and 8 ft.), two pyramid-pointed moils of 1¼-in. octagon steel, 3 and 6 ft. long; two scrapers, two tamping sticks, two Ajax shovels (at $1 per pair), one 7-lb. hammer and one saw and one ax (at $1 each), one powder heater, rented at 50c. per month, one box in which to store powder, fuse caps, etc. Picks and augers are supplied, sharpened and kept in repair by the company. The contractor pays $6 for 240 Granite candles and $8 per 50-lb. box of Red Cross dynamite. Stoping contracts are usually let at so much per car drawn from chute. In square-set slicing the price is sometimes based per set or car. In slicing, under ordinary conditions a double slice 16 ft. wide, 15 ft. high, 50 ft. long is taken out in two weeks by a four-man gang. The usual rate for a single slice one set wide is from 150 to 175 ft. per month.

Horizontal openings, whenever possible, are run in the ore on account of the cheapness and speed with which they may be driven. The Mesabi mines are rarely equipped with machine drills, hence crosscuts in rock are avoided. The main haulage levels or drifts are usually timbered with a three-piece set of unframed timber; 9-ft. posts and 10-ft. cap; inside timber dimensions 8x9 ft. It takes two men about 1½ hr. to put in a set. The ore is soft and holes are put in with auger or gad. A round consists of five to seven holes 6 ft. deep. A 6-ft. hole is drilled in from 10 to 30 min. The back holes are loaded with seven to 10 sticks of 40% dynamite and lifters with six sticks. The average monthly progress on main haulage drifts of this size ranges from 100 to 125 ft. a month and contract price ranges from $3 to $4 per ft. including cost of timbering. The rate on wet ground or ground containing many layers of taconite sometimes runs as high as $5 to $6 per foot.

In running rock drifts by hand the advance is from 25 to 40 ft. per month. With compressed air the speed of driving in rock will range from 50 to 75 and sometimes 100 ft. per month. Contract prices on rock drifts range from $9 to $12 and sometimes to $20 per foot. The rate of advance in smaller drifts ranges from 200 to 225 ft. per month on a four-man contract. At the Corsica mine a piece of heavy ground was encountered that necessitated spiling. Six-inch round poles, 8 ft. long, were sharpened and driven over a false set, about 12 poles to a set. The contract labor price was about $2 and cost of timber (sets at 4-ft. centers) and lagging about $1.50 per ft., making a total price of $3.50 per ft. for a spiled drift. Owing to the nature of the ore there is frequent crushing and displacement of timbers in many of the mines and repair work is constantly going on. The older the mine the heavier the repairs. Two men can take out and replace from 1½ to 3 sets of timber in a 10-hr. shift for large and small drifts respectively. Often retimbered ground will not hold over one week. From 10 to 15 men on repairs are usually required in addition to the repair work done by contractors who receive regular wages on this work. This work is sometimes contracted for $1 to $1.25 per ft. for 8x7-ft. drifts. Raises vary from 4x5 ft. to 5x8 ft. according to the purpose for which they are to be used. They are contracted for at $1 to $3.50 per ft. depending upon the ground and method of timbering.

The mine timber costs from 4.5 to 5.5c. delivered at the yards, per running foot for pine and tamarack up to 10 in. diameter at the small end, cut in 16-ft. lengths. Timber for heavy drift sets costs from 8, 15 and 20c., depending upon the size and market conditions. Lagging costs about $5 per cord piled in the yard. A contractor framing timbers makes from $2.50 to $3 per day. Current contract rates are as follows: Three-piece set, 7c. to 10c. each; square-set posts, top and bottom respectively, 12 and 9c., respectively, square-set caps, 7c. each. Ties are made of 6-ft. lagging squared at top and bottom and cut into 6-ft. lengths for 2.5c. each. They are cut in two underground.

Butte Meeting, A. I. M. E.

SYNOPSIS—Special correspondence covering the meeting of the Institute at Butte day by day.

The 105th meeting of the A. I. M. E. opened at Great Falls, Mont., on Saturday morning, Aug. 16, the headquarters being at the Rainbow Hotel, the new and comfortable hostelry of one of the most charming towns of Montana. In connection with this meeting, no excursion had been officially arranged and the visiting members drifted in in small groups. Their reception and the management of all the meetings in Montana was directed by Charles W. Goodale, and let it be said right here that there was never a more accomplished and painstaking chairman and never a meeting that was conducted with fewer hitches or any more attention to the enjoyment of visiting members.

Great Falls

On Saturday morning the party was taken in automobiles to see the great falls of the Missouri River, where construction work for power development has just been begun. The Rainbow Falls, whereof the power has already been developed, were also visited, and the Giant Spring, on the other side of the river. Returning to Great Falls, luncheon was served at the Rainbow Hotel. In the afternoon, a visit was paid to the reduction works of the Anaconda company, which are noted for their posession of the tallest and largest chimney of the world, an extraordinarily large converter, an electrolytic-copper refinery, and many unique features of metallurgical practice.

In the evening the first technical session of the meeting was held in the county court room, which had courteously been put at the disposal of the Institute by Judge Ewing. President Rand made a brief, opening address in well chosen words, following which several technical papers were read, these relating especially to the metallurgical practice at Great Falls. Most of the papers read at this session, as well as at the subsequent sessions, had previously been published in the bulletins of the Institute and no special reference to them will be made in this chronicle of the meeting. It will be sufficient to say that all of these papers were enthusiastically received, and some of them induced discussion, but in the main they were of a character to cause their acceptance as expositions of an advanced technical practice without discussion.

The Great Falls local committee consisted of Messrs. A. E. Wheeler, J. H. Klepinger and W. T. Burns. Unfortunately, Mr. Wheeler had been called to Europe just prior to the meeting. He was missed, but his confreres ran things admirably.

Helena and East Helena

The original plan was to take the party from Great Falls to Butte by special train, with a brief stop at Helena for luncheon. This was abandoned for the reason that the attendance at Great Falls was not so large as expected, probably because this part of the meeting had not been advertised in the bulletins issued from New York so well as should have been done. Consequently the special train was abandoned and two special cars were hauled to Butte by regular trains. This change of plan proved fortunate inasmuch as it gave the party an opportunity to visit the plant of the American Smelting & Refining Co., at East Helena.

Leaving Great Falls at about 9 a.m. and arriving in Helena at about 12.30 p.m., the party was taken in special trolley cars, provided by the Helena local committee, to the Placer Hotel, where a bounteous luncheon was served. After luncheon the party divided, some to see Helena and some to see the smelting works. The latter were of good interest, exemplifying most of the latest features of the practice of silver-lead smelting.

During the visit to Helena the courtesies of the Montana Club were extended and were enjoyed by a party of the visitors. The Helena local committee comprised Frank M. Smith, William Scallon, and George T. Wickes. Leaving Helena at 4.20 p.m., the Institute party reached Butte at about 8.30 p.m.

Butte

The Butte committee consisted of C. W. Goodale, E. P. Matthewson, J. D. Pope, G. A. Packard and D. C. Bard, Mr. Goodale being the chairman and Prof. Bard the secretary. Headquarters were at the Silver Bow Club, the courtesies of which fine institution were extended to all visitors during the meeting. On Sunday evening there was an informal reception at the club, not on the program, but interesting just the same and doing much to make the visitors acquainted with each other.

On Monday morning the meeting convened in the Auditorium, C. F. Kelley delivering the address of welcome and President Rand responding. Technical papers then were read. At noon luncheon was served in the Silver Bow Club. In the afternoon visits were paid to the mines and mills of Butte. In the evening there was another technical session.

At Anaconda

On Tuesday morning the party proceeded to Anaconda by special train, going directly to the Washoe reduction works, which were inspected, after which luncheon, tendered by the Anaconda local committee, was served at the Hotel Montana. In the afternoon there was a technical session in the Margaret theater. The Anaconda committee consisted of E. P. Matthewson, Fred Laist, E. M. Dunn, C. D. Demond, L. V. Bender, H. S. Ware and H. L. Welsh. Returning to Butte, the evening was passed in social entertainment, including an exhibition of moving pictures of power development in Montana, taken by Max Hebgen, general manager of the power companies; and in a visit to Columbia Garden.

Wednesday

Wednesday was devoted to technical sessions in the morning and evening, and to a visit to mines and mills during the afternoon. At mid-day a buffet luncheon was served at the Silver Bow Club. At the conclusion of the evening session, President Rand announced that the serious business of the meeting had been done. He expressed the thanks of the visiting members for their hospitable reception at Butte and his appreciation of the great interest in the Institute. As an exhibition of the latter, he announced that a petition had been received by the directors to establish a Montana local section,

which petition had been granted. E. P. Matthewson will be chairman of the new section.

Picnic at the Southern Cross

On Thursday morning, the party went by special train to the Southern Cross mine of the Anaconda company, about 20 miles west of Anaconda. This mine is situated in a highly picturesque position and has surroundings admirably adapted for a picinc. The officers of the Anaconda company who gave this entertainment carried out the picnic idea.

After an hour spent around the surface workings of the mine, during which time those went underground who wanted to, the party assembled at headquarters, where everyone received a miner's dinner pail and a bottle of Budweiser. With this provender groups collected under the trees for luncheon. The dinner buckets were of the full kind that politicians talk about in their campaign speeches, and the bottles of beer were of the quart size, which, as one visitor put it, was very thoughtful of the company. After luncheon there was general conversation and some assembling of college men. It was noteworthy that in the party of about 150 engineers, there were 18 M. I. T. men, 16 from Columbia and seven Harvard men, this illustrating the extent to which technically trained men are permeating the ranks of engineers in practice at the present time. Soon after luncheon the party started homeward for Butte.

The Banquet

The concluding event of the Montana meeting was a grand banquet at the Silver Bow Club, tendered by the mining companies of Butte. About 250 were seated at the tastefully decorated tables. The college idea, which had been started earlier in the day, found further expression at the banquet, in a quite impromptu way, and it was no stretch of the imagination to pass in thought from the dining hall of the Silver Bow Club to an alumni gathering in New York.

W. L. Saunders presided as toastmaster, of course, in his well known, felicitous way. The toasts were wisely limited in number. They were "Butte," by C. F. Kelley; "The A. I. M. E.," by C. F. Rand; "Montana," by Lee Mantle; "The Press," by J. H. Durston; and "Co-operation for Institute Progress," by Bradley Stoughton.

In Conclusion

The registry at the Montana meeting was about 160 and was representative of the best of the A. I. M. E. membership. The meeting will be remembered as one of the most successful in the history of the Institute. The mining companies and mining men of the four places that were visited were overwhelming in their hospitality and lavish in their entertainment. Mines, mills and smelting works were everywhere thrown open to examination and no restraint was imposed upon the seeker of information. Special trolley cars and railway trains were provided whenever needed and the requirements of the inner man, both in the matters of food and drink, were bounteously supplied. While the engineers of the party were attending the technical sessions, the ladies were entertained by the ladies of Butte, Anaconda and Great Falls. The Montana meeting passes into history as one of the red-letter meetings of the Institute.

Use of Electricity in Butte Mining

The Anaconda Copper Mining Co. operates 22 mine shafts and plants at Butte. Of these, 15 are large plants and hoists, with which most of its ores are hoisted. In 1912 this company commenced using compressed air in place of steam, to operate a number of its large hoists, and at this date has 10 main hoisting engines and 10 auxiliary hoists driven by air.

The compressed air is furnished from a central plant containing six compressors, each having a capacity of 7500 cu.ft. of free air per min. compressed to 90-lb. pressure in large receivers, and conducted by suitable pipelines to the various hoists, the air being reheated before passing to the engines. Each of these compressors is driven by a 1200-hp. synchronous motor, directly attached to the drive shaft, and takes electric current at 2200 volts. Two additional compressors are being installed, making eight in all; this will complete the compressing plant. Seven of these machines will run continuously, and they will use 8000 electric horsepower. The excess air, or blowoff, goes into the rock-drill air system. The hoisting engines, as formerly used with steam, had cylinders 30 or 32 in. in diameter with a 72-in. stroke. To adapt them to the use of compressed air, the old cylinders were replaced with new ones, 34 in. in diameter, having valve mechanism of the most approved type.

The air in rock-drilling operations is used at 85-lb. pressure, and for the large operations is usually furnished from three or four central plants, the smaller mines using individual machines. A total of 13,455 electric horsepower is used for this purpose, the voltage ranging from 440 to 2200.

In draining the mines, electrically driven pumps are principally used, for which a total of 4780 electric horsepower is necessary. The large pumps are of the quintuplex vertical-plunger type, with a capacity of 600 gal. against a head of 1200 ft.; the smaller units are of various types. Centrifugal pumps are not used on account of the acid water.

The mines of the district are warm, due to the oxidizing of the sulphide minerals, so that forced ventilation is largely resorted to. For driving ventilating fans, 2500 electric horsepower is used, and in addition to fans and blowers, compressed air is used after blasting to clear the mines of powder gases and foul air. Underground, the stations, main crosscuts and main drifts are electrically lighted, as well as the surface plants and property. A total of about 1300 hp. is used for lighting purposes.

Electric locomotives are being introduced for all the tramming, both underground and surface, and this work requires 1860 electric horsepower. Direct-current at 500 volts is used for surface tramming, and at 250 volts for all underground tramming. There are a few storage-battery locomotives in use at Butte, but the usual system uses a trolley. The mine locomotives are of 18-in. gage, weighing three tons; have two 10-hp. motors; and develop a draw-bar pull rated at 1200 lb. The average load hauled per trip is 12 tons, including weight of cars and ore, on the usual mine track with grade of 0.5%.

At Butte, Anaconda and Great Falls, all the Butte ores are treated, except that zinc concentrates, containing about 50% of zinc, are shipped to the natural-gas districts

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Note—Excerpts from an article by John Gillie, presented at the Butte meeting of the A. I. M. E.

for smelting. Of the copper ores, about 80% is reduced to converter or blister copper, containing the gold and silver, which is shipped to the large electrolytic refineries on the Atlantic coast. The remaining 20% is fully treated, merchantable wire bars and other forms of finished copper being produced, and the gold and silver separately obtained, at an electrolytic refinery in Great Falls. In these ore-reducing plants, 24,177 hp. is used, in driving concentrators and blowing engines, and in operating cranes, shops and the different power machinery in connection therewith.

In connection with the use of electricity in mining, it might not be out of place to briefly mention the electrification of the Butte, Anaconda & Pacific Ry., which is now nearly completed. This railroad connects the mines at Butte with the reduction works at Anaconda, and handles about 5,000,000 tons of freight yearly, consisting of ores from the mines and supplies of all kinds to both mines and works. In addition to the freight thus hauled, the passenger business between the two cities is taken care of by this road. The conditions, including grades, curvature and climate, are sufficiently severe to prove thoroughly this method of railway transportation. The constructing engineers adopted for this work a 2400-volt direct-connected system, with overhead trolley. Freight locomotives will consist of two units, each weighing 80 tons. Passenger locomotive will be one 80-ton unit geared higher to permit of a speed of 45 miles per hr. A part of the road has been electrically operated for several weeks, and is working satisfactorily.

Copper-Country Strike Comments

HOUGHTON CORRESPONDENCE

The socialistic element has continued to dominate the situation, during the last few weeks of the strike in the Lake Superior copper country, covertly under direction of prominent politicians trying to make capital out of the situation and holding out the only hope that was being held out to the strikers and to the officials of the Western Federation of Miners. This element seems to have much influence and the independent business men of the copper country are convinced that the strike would be over and the mines working normally if it were not for the moral support given the strikers and the courage put into their leaders by reason of the action of the State and Federal governments in sending investigators and mediators to Houghton, and it is felt in some places that this action was at the instance of these politicians.

There is no doubt that the majority of the workingmen of the district never wanted the strike and did not countenance it when it was called. The majority of the men desire to return to their work and several thousand have returned. But it has required a great deal of nerve and courage to go to work under the existing circumstances. The situation is that practically all of the English and Scotch miners are back at work. A large number of the Italian miners had signified their intention of returning to work. They claim that the situation was misrepresented to them, that they have not received their strike benefits, as promised, and that they can see nothing to be gained by remaining away.

The Finns and the Austrians are holding out for the Western Federation and the continuance of the strike, and most of these are socialists, particularly the Finns. The spirit of unrest and opposition to any organized government is born and bred in the Finn. It comes with him from his native land and when he gets a home and a job in this country it is difficult for him to distinguish between license and liberty. The Finn socialist is against the government, no matter what the government may be. There are two Finnish daily newspapers published in Houghton and several weeklies. One of these dailies is avowedly socialistic and its editors, managers and employees are the leaders in the strike movement. Moreover, some of its most active men are employed by the secret service of the Western Federation and their speeches are of such an inflammatory nature that there is general fear that they will incite some of the more ignorant believers in their doctrines to dynamite outrages. The other Finnish daily has recently come out in favor of the strike and that position has added to the general antagonism toward the Finns as a class, upon the part of the public that generally is hopeful for a return to normal conditions.

By the end of the third week in August, the strike had cost the workingmen more than $1,000,000 in lost wages. In some instances it has cost the workingmen their jobs, for the mining companies in resuming operations are diligently weeding out the more rabid of the agitators and socialists and refusing to take them back at any cost or on any terms. They are showing a preference for the better class of labor and are securing promises from all of the men who return to work that they are going to keep away from affiliation with the Western Federation of Miners. These facts are becoming pretty well known throughout the country and a general influx is anticipated in a short time. In fact quite a few of the miners from the southeastern Missouri lead district, where the Federation recently called a strike, have already arrived and have applied for work and not a few of the workmen from this district who went to Detroit to take jobs in the automobile factories are inquiring about positions in the copper country. It is thought that these last anticipate a strike outbreak instigated by the Industrial Workers of the World, in a short time.

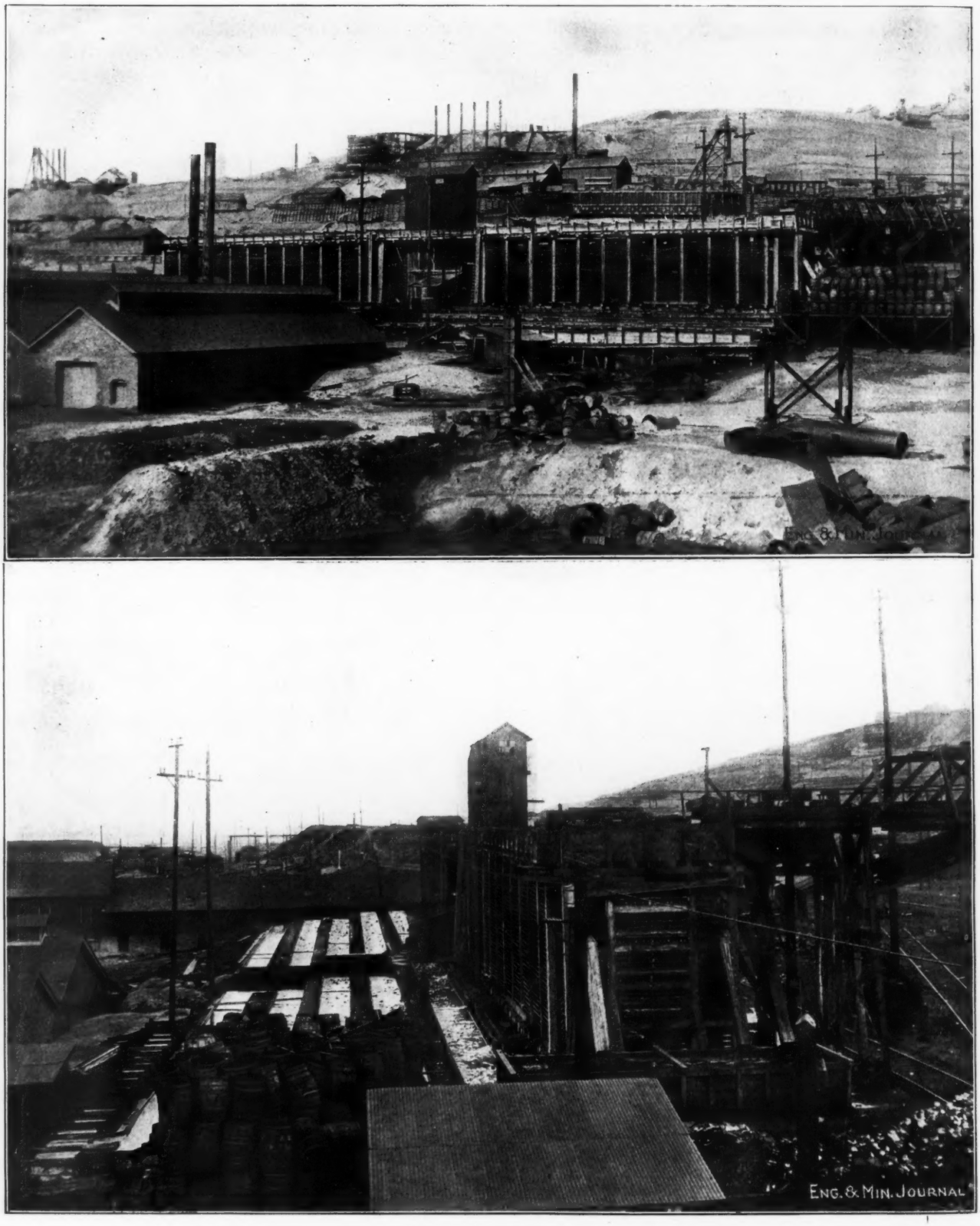
Chino Copper Co.

For the second quarter of 1913, including April, May and June, the Chino Copper Co. produced 4,046,813 lb., 1,067,486 lb. and 3,876,533 lb. of copper, respectively, a total of 11,999,832 lb. The total amount of ore milled was 492,850 tons, an average of 5416 tons per day.

Average copper in ore was 1.88%, and average extraction 64.48%, corresponding to a recovery of 24.33 lb. copper per ton of ore. Cost per pound of copper was 9.01c. If miscellaneous earnings were credited, it would be 8.71c. per lb. All costs are included in this figure, together with 30c. per ton of ore treated for extinguishment of mine development and stripping expense. During the quarter, $1,510,500 par value of the company's bond issue was exchanged for 60,420 shares of stock, leaving $754,500 par value of bonds outstanding.

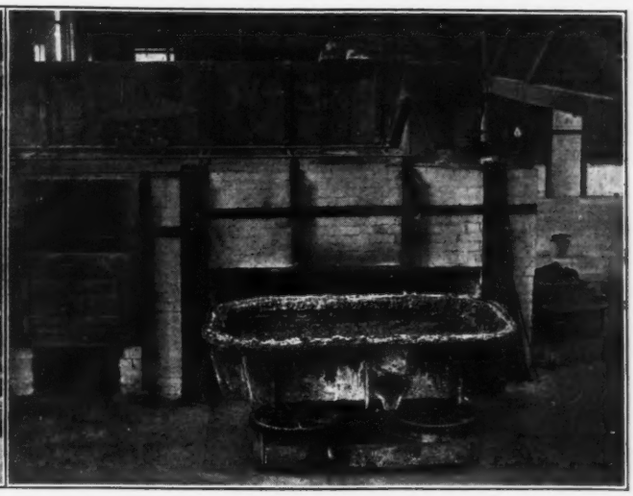
Net profit from milling operations was $682,052; miscellaneous income, $34,706, a total of $716,758. Dividends of $629,790 were paid, leaving $86,968 surplus. Copper on hand at the end of the quarter, sold and unsold, was 14,519,877 lb., inventoried at 13.828c. per lb. average.

PHOTOGRAPHS FROM THE FIELD



PRECIPITATING PLANT AT LEONARD MINE, BUTTE, MONT.

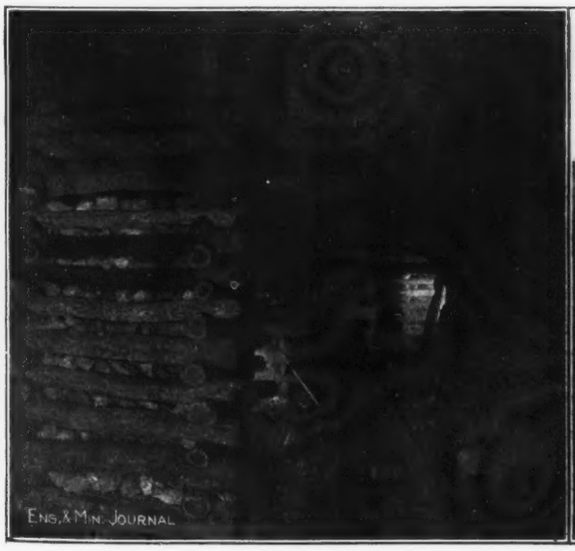
Melting Room, Cylindrical Crucible Furnaces in Foreground



Hearth of Cupel Furnace Lowered on Truck and Removed

Shovelers. The Hammer-Point Pick Is Much Used in Australia

Drilling in Square Set Stope, One Man Running Water Nozzle



Timbering in Many Peaks Mine

No. 6 Dam from Power Station Stack

Workings of the Mount Morgan Gold Mining Co., Queensland

Michigan Iron Ranges

MARQUETTE CRRESPONDENCE

Only one property in the Michigamme field of the Marquette range is active, and this one is being wrought on a meager scale. Operations are, in fact, confined to surface work. The mine is the Portland, a possession of the Rogers-Brown interests. Work preparatory to actual mining, such as building a shaft house and installing a crusher plant, is in progress; 25 men are employed. Under the new system adopted, ore from the mine will be dumped into a pit, the bottom of which will be inclined, and will run into skips which will hoist it to the crusher. As is the case at the other Michigamme properties, the Portland produces limonite ore of low grade, and for which at present there is little demand. It had been expected that the Cleveland Cliffs company's Imperial mine in this district would be operated this year, but the property continues inactive. There recently was erected at the Imperial a fine steel headframe, aside from which the hoisting plant was overhauled and bettered.

While a start has been made in opening the Athens mine at Negaunee on the Marquette range, it probably will be two years hence before the property is in a position to produce ore in any great quantity. The initial depth of the shaft will be 2200 ft. The first 40 ft. of this is overburden, which has already been penetrated and which will be walled with concrete 1½ ft. thick. The concrete will extend well into the orebody. Eventually drifts will be driven to the Negaunee mine of the Cleveland Cliffs Iron Co. a few hundred feet northeast. The Cleveland Cliffs company and Pickands, Mather & Co. are jointly interested in the Athens and will develop and operate the tract as the Athens Mining Co. The existence of ore was revealed by diamond drilling, exploration of which nature still continues. Temporary buildings have been constructed. Next spring a permanent power house, a shop building and other structures, contracts for which have already been awarded, will be erected.

DRAINING LAKES FOR ORE

At some time in the future, probably many years distant, part of Lake Michigamme will cease to exist. The iron formation in that part of the Marquette range traverses the northern end, and eventually this end of the lake will be drained to permit mining the ore. Excepting Lake Gogebic, Lake Michigamme is the largest inland lake in upper Michigan. Unwatering its basin will not be without precedent on the Marquette range. Lake Angeline, at Ishpeming, was drained years ago, and there have already been mined from under its old bed many millions of tons of ore. North Lake, west of Ishpeming, where the Cleveland Cliffs company is developing ore, will probably be unwatered at no distant day, as ores undoubtedly occur beneath it. In the Cascade district of the Marquette range, the Volunteer Ore Co., of Duluth, has drained a portion of Palmer Lake. There are deposits of ore under both Lake Bancroft, at Ishpeming, and Teal Lake, at Negaunee, and these two bodies of water, too, will disappear some day.

The Montreal Mining Co., operating in the Wisconsin part of the Gogebic range, has awarded a contract for the erection of an office building, 20 houses for mine employees and a residence for the superintendent. Ten miners' dwelling houses at Ramsey and 10 at Wakefield, also on the Gogebic, will be built by the Castile Mining Co., operating on the Michigan side of the Montreal River. The contracts for all of this work have been given to the Foster Construction Co., of Milwaukee. Operations will be rushed, in the hope of completing the work before the advent of severely cold weather. At Ironwood the Foster company has under way much construction work for the Newport Mining Co.

MINERS COMING IN FROM COPPER COUNTRY

Many miners thrown out of employment in the copper country on account of the labor strike are finding work in the iron districts, notably on the Gogebic range and in the Iron River field of the Menominee. These miners are English-speaking, in many instances men of Cornish birth, and their coming to the iron ranges is welcome.

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Ray Consolidated Copper Co.

Report of this company for the second quarter of 1913, months of April, May and June, show a production of 4,514,565 lb.; 4,495,217 lb.; and 4,392,612 lb. of copper, respectively, or a total of 13,402,394 lb., produced at an average cost of 9.558c. per lb., after crediting income from the Ray & Gila Valley R.R., but no other miscellaneous income. The average cost for the half year is 9.5348c., which includes all operating and general charges as well as a charge of 12.5c. per ton of ore treated, or 0.56c. per lb. of copper produced, for the extinguishment of mine development expense.

In addition to copper contained in concentrate, there was produced 84,294 lb. from ores shipped direct to the smelter without concentration, making a total of 13,486,688 lb. produced. Total ore milled for the quarter was 587,877 tons, a daily average of 6460 tons. Average mill recovery was 66.915%, and 35,938 dry tons of concentrate were produced, containing an average of 18.647% copper. Ratio of concentration was 16.358:1.

The first quarterly dividend, at the rate of $1.50 per share per year, was paid on June 30, the sum being $543,662. Direct operating profit for the quarter was $716,601; miscellaneous income, $10,158, making a total profit of $726,759. Copper on hand and in transit, sold and unsold, was 16,833,979 lb., inventoried at 14.148c. per lb. Average cost of mining, exclusive of 12.5c. development charge, was 73.92c. per ton, and the milling cost was 45.25c. per ton.

Seven sections of the mill at Hayden were in continuous operation and the eighth will be in use in August. Underground development for the quarter amounted to 22,870 feet.

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Russian Iron and Steel

Iron and steel production in Russia for the year ended Dec. 31 is reported as below, in long tons:

	1911	1912	Changes
Pig iron	3,525,000	4,118,000	I. 593,000
Steel ingots	3,874,000	4,418,000	I. 544,000
Finished steel	3,258,000	3,674,000	I. 416,000

The pig-iron production was the largest ever reported. The exports of pig were 1000 tons; imports, 44,000; making approximate consumption, 4,161,000 tons. The production of steel was also the largest ever reported in a single year.

CORRESPONDENCE AND DISCUSSION

A Five-Ton Smelting Furnace that Smelts

Replying to Mr. Mace's recent rejoinder to my criticism concerning a "Five-Ton Smelting Furnace that Smelts," it seems to me that Mr. Mace fails to meet my objections. In Mr. Mace's first article in the JOURNAL of May 3, in which the drawings of a five-ton Partridge furnace, together with more or less so called "data" of a test run made in Knoxville last fall, are given, the author lays no claim to any new discoveries in the chemistry of smelting, but really attributes his remarkable results to two causes, both pertaining to the above furnace: (1) The enormous increase in his blast volumes, due to the "continuous aperture," and (2) the recovery of heat from the slag.

Since the volume of air passing through this "aperture" is a measure of its efficiency and varies directly with it, therefore our author insists that his furnace is receiving the full volumetric displacement of his blower, *i.e.*, for the matting charge, when the furnace proved most efficient, 600 cu.ft. of free air per min. are passing into the furnace. The heat necessary to heat this weight and volume of air (or the resulting gases after combustion of oxygen) is more than that derived from the combustion of all the coke claimed to be used on the charge (5%) and three-fourths of all the sulphur (¾ of 8%). Again casting up our heat balance sheet and allowing a heat recovery of 90% from the slag and also all the heat from the formation of an iron bisilicate slag $FeO.SiO_2$, we have evolved per minute:

Heat from combustion of carbon in coke	7,721
Heat from combustion of sulphur in charge	2,910
Heat from formation of silicate	968
Heat from slag absorbed by blast	4,584
Total	16,183

The heat evolved by the combustion of the sulphur is of little benefit to the smelter since the oxidation of most of this element takes place at the top of the charge, but since I have calculated the oxygen for this as delivered by the blast, we will let it stand. According to Mr. Mace, there are 600 cu.ft. (46.8 lb.) of air at ordinary temperature and pressure delivered diluted to the furnace, and this is instantly heated to 2156° F. If the temperature of air to begin with is 60°, then the volume at 2156° is 3021 cu.ft., and the necessary heat units to effect this increase in temperature and volume would be (if we allow for the increase in the specific heat of the gases with increase in temperature, at their high temperatures), something over 40,000 B.t.u. per min. Of course, some of this heat will be absorbed by the ore column, but in a 4-ft. ore column containing not more than 50% voids, the velocity at the tuyere zone would be 66 ft. per sec., so there would be little chance for retardation or cooling. We have available (allowing liberally for everything) 16,183 B.t.u. per min. There is required to heat the blast alone 40,000 B.t.u., leaving a deficit of, say 23,817 B.t.u. Then there is the heat lost in jacket water, that contained in molten matte, and the heat units otherwise lost in radiation which must be provided for. Evidently, then, Mr. Mace must do one of two things, cut down the volume of his blast, or increase his fuel. He informs us that "the greatest metallurgist in the world would be unable to keep the furnace going 30 min." on the calculated amount of air, so we are forced to the other conclusion, viz., that Mr. Mace is using more than 5% of coke on his "matting" charge.

But why continue our inquiries any further since Mr. Mace assures us that he is too busy "to delve into the realms of thermo chemistry," while his furnace is in blast, with a "green crew" on his hands hustling around, charging in nearly a shovelful of ore and fuel every minute, and it is evident that he has no taste or disposition to do so when he is not thus engaged?

It is encouraging to one of the profession to note that Mr. Mace still insists upon the necessity of having a trained man in charge of the furnaces, but many operators, I think, would object to paying one-third of the total cost of smelting for superintendence.

ROYAL P. JARVIS.

Miami, Ariz., Aug. 10, 1913.

Promoting and Engineering Ethics

In connection with the discussion of professional ethics as applied to mining engineers, the following question has been asked. "Should a mining engineer engage in promotion"? The revival of this topic, in this instance, is prompted by an article published in the JOURNAL of May 24, 1913, and entitled "Consulting Engineers." While I do not place myself in the category of those who are said to be a "financial drain," "increasing the cost of all metal-winning processes," (did anybody whisper "sour grapes"?) I wish to shed publicly a few tears of pity and commiseration for some of the unhappy companies which, although they may have prospered and paid large dividends, nevertheless have been so blind to the interests of their stockholders as deliberately to encourage the growth of such pernicious parasites as consulting engineers.

If it is true that the majority of the practical mining men have an abhorrence for the engineer whose mission in life is said to be that of "pestering" the "man on the job"; why is it that these "diabolically ingenious" ones, who have acquired the "superficial knowledge of several districts" and have chosen to make an honest effort to transmute that superficial knowledge into bacon and beans, are continually pestered in turn by the hordes of "practical" mining men who are seeking capital to develop holes in the ground? Is it a matter of pure revenge? Furthermore, considering the almost universal repulse which greets their advance, is it not within the proprieties to consider that the hostility toward consulting engineers is in many cases merely a manifestation of the "knocking" so often the result of "lost motion" in a crank-pin box?

I venture to state that of the thousands of mining prospects which have been partly developed, incorporated, promoted, passed through stages of apparent prosperity, lingering illness and death or prolonged cataleptic coma, but a small percentage had the experience of being guided by a consulting engineer of university training and even a superficial knowledge of various districts.

But when the corpse is in a condition fit for the undertaker, and sometimes fairly stinking of loot and graft, the "practical" mining man frantically beseeches the consulting engineer to come to the rescue and, to continue the analogy, bring the pallid child back to life by applying the pulmotor or by blood transfusion. The consulting engineer is generally expected to supply the paraphernalia and often also is requested to find the healthy subject who will furnish the blood. A practicing physician, called in an emergency to remedy the bungling efforts of an ignorant midwife, is bound by his code of professional ethics to do all that he can to preserve life.

Coming back to the mines, the trouble seems to lie in the fact that the ordinary promoter and his associates have too often usurped the field properly belonging to the usually technically trained consulting mining engineer, graduated from the ranks of the "man on the job." Have we not all heard the story of the mining engineer who wired his principals that the mill would have to shut down on account of the mine shaft having caved in, and who received a telegram from the promoter instructing him to "purchase a second-hand shaft and resume operations at once"?

Often the man on the job, himself frequently a university graduate, could successfully perform the functions of consulting engineer; were he consulted. But the necessity for making a good showing, temporarily at least, until certain stock can be placed to advantage, on an excessive capitalization, impels the promoter and his associates to crowd on the engineer such a multitude of tasks that he is unable to devote sufficient time to working out problems the importance of which are quite apparent to him, but which his employers refuse to heed. The engineer is compelled to do what he is told, though it may be entirely at variance with his own convictions. In such cases he truly is pestered. If he is quite young and entirely honest, he may feel that possibly he himself may be in the wrong, as he frequently may be; but it is certain that such conditions tend to reduce his efficiency. What he commonly does is to hunt another job; either voluntarily or involuntarily. If later developments at the mine should prove that he was right, it is unlikely that the officials of the company will take great pains to advertise the fact; yet the engineer may justly feel that he is entitled to act in a consulting capacity with respect to similar problems in other localities. Should he have the good fortune to associate himself with congenial employers and succeed in making good with them, he becomes established. But the supply of congenial employers is apparently limited.

Careful observations have demonstrated that the average term of employment of the technically trained young mining engineer is about one year or possibly less. Wherein lies the fault? Partly with the engineer, beyond a doubt, due slightly to his disinclination to bow submissively to the rule of those who, like a certain well known inventor, contend that: "The college-bred ones are not worth a ——." However, is it not reasonable to suppose that the non-technical promoter deserves the greater share of condemnation for the short lives of both employment-terms of mining engineers and of mining enterprises themselves?

The varied experience of the average mining engineer of several years' standing tends to make him conservative rather than blatantly optimistic, and it is my sincere belief that the mining investor stands a reasonable chance of protection when placing his speculation with an enterprise promoted by a mining engineer who, however obscure he may be, has had the opportunity to observe the causes of the failures of others.

For the mining engineer whose reputation is free from the slightest stain and whose professional or business honesty has never been questioned, the promotion of engineering enterprises on a rational basis is a perfectly legitimate field. It is quite ethical for him to observe the field, investigate the probable fertility of the soil, and then to plough it.

WILLIAM B. MCKINLAY.

New York, July 21, 1913.

Automatic Weighers in Dusty Situations

In an article by Claude T. Rice, in the JOURNAL of June 21, 1913, the statement is made that dust interferes seriously with the working of automatic-weighing devices of the type used on belt conveyors, and that agents have not been desirous of installing them.

This is a subject, the importance of which is increasing daily, and I believe that attention should be called to the fact that belt-weighing devices until recently have all been operated by strictly mechanical means of considerable refinement. These mechanisms have depended for their accuracy upon the precise relation of moving parts which were subject to wear. Such conclusions as the one reached by Mr. Rice must of necessity be based on experience with weighers of the mechanical type.

There is now on the market, however, a device made by the company with which I am connected, which works on a radically different principle (cf., ENG. AND MIN. JOURN., Sept. 16, 1911, p. 551). In this device the moving parts are so reduced in number and their functions are such that dust, even in the most aggravated cases, does no harm whatever. It is no longer correct, therefore, to imply that any one should hesitate to install a conveyor scale on account of the presence of dust.

E. H. MESSITER.

New York, Aug. 6, 1913.

Regulating Moisture in Sand Discharged by Dorr Classifier

In my article on "Regulating Moisture in Sand Discharged by Dorr Classifier" (published in the JOURNAL of Aug. 2, 1913), I stated that, "By using this appliance the amount of water in sands could be reduced from 60% to only 12%."

The determinations of moisture had been made in the laboratory, and I did not check them myself until lately, when some doubt as to their exactness had risen. I found that the correct figures were consecutively 69% and 19.5%.

M. G. F. SÖHNLEIN.

Machacamarca, Bolivia, June 28, 1913

EDITORIALS

Silver Prices

The silver market for the last six months has been remarkably steady, showing only a very gradual and slow decline from the high point reached in January of this year. The average for that month was very close to 63c. in New York and 29d. in London, the highest point which has been reached for several years. The conditions, however, have not proved sufficient to maintain the level which was then reached, and although the strong speculative interests which have dominated the market for nearly three years past are still in evidence to some extent, it was not possible to advance the prices in the face of adverse conditions. The considerations which advanced silver at the close of the last year, were chiefly the anticipation of a heavy demand from China, but the political and business conditions in that country have been adverse throughout nearly the whole of the present year. The new government was not strong enough to undertake the expected revision of the currency, and the unsettled state of political affairs prevented the revival of trade which many looked for. The placing of a large government loan, which had been generally expected, was not possible, and consequently the demand for silver has been only on a moderate scale.

The average price of silver in London, however, has declined by only a small amount, falling from 28.983d. in January, to 27.074d. in July, and it seems inclined to remain at about that level. Possibly it might have fallen further, but two or three influences combined to hold it at about that point. The first was undoubtedly the support of the syndicate of Indian banks and speculators, and the second was the comparatively moderate receipts of new silver. Nevertheless, shipments from London to the East for the seven months of the present year have been the smallest recorded for six years. In the early months, they were rather in excess of those in 1912, but for the last three months they have been falling off and the total to date is now considerably below that of last year at the same time. Indian crops and exports have been fairly good but the demand from that country has not been sufficient to overcome the effect of the heavy stocks accumulated there, which have been weighing on the market for nearly a year and a half. To the effect of these stocks was added the large imports of gold into India, which were the heaviest ever known and which necessarily took the place, to some extent, of the silver which has been needed there.

The success of the speculative syndicate in preventing any great fall in prices has been remarkable, and it seems likely that it will continue, notwithstanding the existence of large unsold stocks. At the present time, it is estimated that stocks in London are about £4,200,000. Those in Bombay are comparatively low, being £460,000, but in Shanghai and Hongkong they have risen to a pretty high figure, being reported at £6,060,000. This makes a total of a little over £10,700,000, which is a heavy amount to carry; unless political affairs in China brighten sufficiently to require some of it for immediate use, and this looks rather doubtful.

On the other hand, the new supplies coming in have been unusually light. The production in Mexico has been considerably reduced so that the shipments from that country have shown a decided falling off. The United States has furnished about the usual amount, the quantity of silver refined here having been kept up by receipts from South America and other countries, so that the net exports so far this year have been a little larger than they were a year ago. The net exports from this country—nearly all of which went to Europe—for the seven months ending with August, were 28,885,000 oz., approximately. The shipments from London to India and China for the same period, were 42,542,000 oz., and these, as we have said, were the lightest for several years.

There appears to be no disposition at the present time to start any speculative movement in silver, the market being quiet and the important interests being satisfied with the present price. There is no reason to anticipate any special movement. The Indian crop advices are favorable, indicating that there will be a normal demand for the metal. The currency reserve is reported large, so that there is little or no probability that the Indian government will be in the market for a good while to come. If anything, a decline, rather than an advance, might be anticipated, but it is not likely that there will be any notable change for some time to come.

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The Mexican Situation

The Mexican situation still continues extremely doubtful and disturbed. The special envoy or messenger sent by President Wilson to the City of Mexico does not seem to have been able to come to any agreement with the Huerta government, although a more pacific understanding was probably reached before Governor Lind left Mexico and some of the doubts expressed on his first arrival had disappeared. It is clear, however, that no offer from the United States to mediate between the contending parties will be acceptable, or is likely to be considered at all. It is perhaps hardly correct to speak of two contending parties, for the opposition to President Huerta is split into several factions. The insurrection is still strongest in Northern Mexico and the operations of the contending parties there are followed by bands of guerillas to whom much of the existing disorder is to be attributed.

President Wilson has promised to submit to Congress a message outlining the situation as it appears to our government, and also his proposed policy in the matter, but up to date this message has been held back, presumably in the expectation of receiving more definite advices from Mexico. Congress seems to be inclined to support the President generally, and the inflammatory proposition of Senator Penrose to appropriate $25,000,000 for the purpose of sending an army into Mexico to protect Americans and American property received no support worth mentioning.

A tentative suggestion has been made from Washington that citizens of the United States generally should leave Mexico. In view of the large personal and property interests of Americans in that country, it is very doubtful whether this suggestion can or will be adopted. A good many have already left the disturbed districts and probably many others would like to do so if they could. A general exodus seems to be rather too stringent a proceeding to be adopted. At the best, the situation is a doubtful one and it is almost impossible to predict how it will develop.

It is reported that some of the companies owning mines in Sonora and Chihuahua are arranging to withdraw their American employees as far as possible, leaving their property in charge of Mexican foremen and assistants for the time.

Australian Mining Accidents in 1912

In the mines, other than coal, of New South Wales during 1912, 31 men were killed and 32 seriously injured. This is a death rate of 1.565 per 1000, and is slightly more than the average for the last five years. In Queensland, the number of deaths was 26 and the number of accidents, 198 for the same year. This corresponds to a death rate of 2.45 per 1000, and is the highest obtaining in Queensland since 1888. Of the 26 fatal accidents, two occurred in shafts, 11 were due to falls of ground, and five were the results of accidental explosions. These figures, taken from the annual reports of the mining departments of the two states in question, show that Australia is far ahead of the United States in the question of mine safety. Taking our death rate somewhere between 4 and 5, it is evident that we have a long way to go yet before attaining to the standard set by the southern commonwealth. The cause is not far to seek. Conditions in American mines are not essentially any more dangerous, and the character of our labor is as high or higher. It is simply that in Australia, public opinion, as reflected in the actions of the government, has done its work. The great interest taken by the state governments in the question of safety is well evidenced in the reports mentioned. The Queensland report, for instance, includes a complete list and detailed analyses of all the accidents occurring during the year, the study of which is sure to be of the greatest value as indicating the lines along which accident prevention must move.

Chinese Iron Competition

The proposed placing of pig iron on the free list has brought one of the Pennsylvania senators to the front, with doleful anticipations of the closing of our merchant furnaces by the rush of imports from China. His figures as to wages and other costs in that country make a striking contrast to those of the Pennsylvania iron makers, but when we come down to actual facts, the prospects of any real competition seem sufficiently remote. China has certainly large resources in iron ore and coal, but their development so far has been exceedingly slow, and does not seem to increase. The largest iron works in China are those at Hanyang, and in this country the plant would rank as a small one; moreover, its total production is far below the consumption in the country. What foreign trade it has is chiefly with Japan, and that country takes more iron ore than pig or finished iron, preferring to do the smelting in its own furnaces.

One attempt was made on the Pacific Coast to import Chinese pig regularly under contract, but that resulted in a rather disastrous failure. The exports of iron from China reached their highest figure in 1911, with 68,630 tons, but in 1912 fell to a little less than 8000 tons. In both years little or none of the exported iron went further than Japan; even if it had all come to this country the quantity would have been less than 0.002% of our consumption.

We are not advocating free pig iron especially; but its opponents to secure success must find some better argument than Chinese competition. The awakening of industrial China is slow and must be slow, in the nature of things. Forty or fifty years from now iron from the East may be a factor in our industrial situation, and then it may be time to protect ourselves. At the present time, however, it seems simply a waste of time to talk about it.

Australasian Gold Production

The official returns of the various states of Australia show that in the first half of 1913 the gradual decrease in gold production, which has been going on for several years, still continues. The total for the six states of the Commonwealth of Australia and the Dominion of New Zealand is given in the table below, in fine ounces, South Australia and Tasmania being partly estimated. The total decrease, as compared with the first half of 1912, was 6%, and the quantity is the smallest for several years.

AUSTRALASIAN GOLD IN 1913

	1912	1913	Changes
Western Australia	627,849	638,369	I. 10,520
Victoria	245,900	229,700	D 16,200
Queensland	170,400	131,191	D. 39,209
New South Wales	94,037	87,283	D. 6,754
South Australia	3,500	3,750	I. 250
Tasmania	17,900	17,250	D. 650
Commonwealth	1,159,586	1,107,543	D. 52,043
New Zealand	199,277	170,276	D. 29,001
Total	1,358,863	1,277,819	D. 81,044
Total value	$28,087,698	$26,412,519	D. $1,675,179

Western Australia alone shows a gain for the half year, but it is rather notable that there should be such a gain after a decrease that has continued for over four years. The change was largely due to an improvement in the grade of ore in some of the Kalgoorlie mines. Queensland had the largest proportional decrease among the other states. Its great mine, the Mount Morgan, continues to prosper, but its chief values are getting to be yearly more in copper than gold. The older and larger districts of Victoria are still gradually falling off, with no new discoveries to take their places.

In New Zealand, the Waihi—the most important mine—has not yet recovered from the decreased values in the lower levels, though better things are promised by the newer explorations. The dredging returns are also lower, as the best ground is being worked out. The dredge men are beginning to turn their attention to new fields and some of them are securing placer ground in the Philippines.

Copper seems to be Australia's hope for the future, with tin as a second. There is also a probability that the iron resources of the continent will be developed before long on a considerable scale.

BY THE WAY

The Rand will have to take a back seat as a gold producer. An esteemed contemporary reports the gold production of the Ashanti mine, in West Africa, in June, at 9798 tons, and that of the Abosso mine, in the same country, at 8049 tons. At this rate West Africa will be this year the greatest gold producer on record. In order that the value of gold may not depreciate too fast, and that Prof. Irving Fisher may not have another fit, we hasten to add that the West African gold is extremely low grade; the 9798 tons produced by the Ashanti being valued at $165,000 only.

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In this country we find the prospecting spirit rampant in all walks of life, and if the ambitions of a recent zealous, though somewhat misguided, prospector could be realized, Kingman, Ariz., would be the unique possessor of a lead-pencil mine. An employee of the Postal Telegraph Co., engaged in digging post holes along the main street of the town, discovered several pieces of lead ore and promptly located the street for several blocks, posting his notice on one of the poles which had just been placed. He took a sample of the ore to a local assayer and, in the meantime, proceeded to try to peddle his claim. The sample assayed over 50% lead, but despite this fact, prospective purchasers seemed to be over-cautious about making any investment. Chagrined but not disheartened, he chided one of them thus: "Begorra, mon! Thot's some lid. Fifty percint. Why, mon, thot's rigular lid-pencil lid."

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Report comes from West Virginia of a sovereign cure for labor troubles. In the light of current labor events in the Middle West, this cure might be of some value to our metal miners. It seems that the Weyanoke Coal & Coke Co., after long suffering with transient labor, the "hobo" miner, devised the scheme of offering prizes for the best gardens, flower and vegetable. After a year of suspicion on the part of most of the employees, the sight of a few real gardens and of the real money prizes made the next year a bonanza garden year for that camp. The beneficient influence of gardening is said to have given the company a corps of steady, orderly, contented, æsthetically inclined, and well fed miners. Steep country, rocks and aridity will militate against the adoption of this remedy in many metal-mining camps, but even under such discouraging conditions, one often sees rather pathetic attempts to till the soil. A little patch of earth in the corner of the cañon coaxed by irrigation with tailing water to support some hardy beans and radishes is a not uncommon sight in the Southwest. Seriously, however, education and help along such lines will often repay a mining company. In Grass Valley, the miner ekes out his wages by owning a house and working a rather complete plant of vegetables, fruit, chickens and perhaps a cow. The relative reliability of the married man with a family is well recognized and he is always considered a desirable element in a camp. When a miner owns his house, garden and stock, he is still more likely to stick to his job. It must be admitted, however, that the situation often looks different to the miner. He has to stick to his job because he is stuck with his house and must stand treatment from his employer that he would never stand, if free to move.

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The Rio Tinto Co. is looking ahead to provide for continued and increased production from its mines. At the recent annual meeting in London, Chairman C. W. Fielding said: "A very small proportion of the ore mined in the past has had to be hoisted up shafts, because comparatively short tunnels driven in from the valleys have enabled our engineers to bring out the mineral from the lodes without any great use of shafts, winding engines or inclines. The lowest tunnel hitherto in use for the two main lodes, the San Dionisio lode and the South lode, is not, however, at a sufficiently low level for the removal of the bulk of the mineral which will have to be extracted from these lodes after about the year 1917. The directors who have recently visited the mines have thoroughly gone into the mining questions in general, and means of moving out and transporting ore in particular, and have authorized the construction of a new deep-level tunnel, 200 ft. lower than the present lowest approach, through which very many millions of tons of mineral as the years go on will be brought to the market on an entirely down grade. This down grade continues on the railway, and practically until the ore goes on to the vessel at the port of Huelva. This new tunnel to be constructed will be about three miles in length and will take three or four years to drive, but its total cost will not represent more than about 1d. per ton on the cost of mineral which will be got out through it."

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It is hard to knock some people out, says the *Australian Mining Standard*, and, therefore, it is not surprising that a deputation of miners should have waited upon the New South Wales Minister for Mines to urge that provision should be made in the Mining Act Amendment Bill, now under consideration, for an export duty on ores. "Vast quantities of ore," it was stated on behalf of the deputation, "were being shipped to Germany and other places, and it was felt by the members of the deputation that the imposition of the proposed duty would lead to great mining development in the States, and encourage the smelting industry. They would like to see state smelting works established." It is not two years ago since the whole matter was exhaustively gone into at the instance of the Commonwealth Government by the smelting companies themselves, the mining industry, and the Mines Department of New South Wales, when the Under-Secretary for Mines reported that while the establishment of additional smelters would lead to a greater consumption of coal and coke, this would be offset by the disadvantages and restrictions which an export duty would impose on the output and disposal of the products of the metalliferous mines, and that in the interests of the mining community the department opposed the scheme. The smelting companies and the mine owners themselves emphatically endorsed the views of the department. In fact, the information gathered in New South Wales was that no one was in favor of the proposed export duty. Dealing with the request for a state smelting works, he pointed out that if a plant were erected in Australia, and equipped with modern appliances for the treatment of such ores as are now exported for treatment, it would cost £4,000,000 at least.

PERSONALS

Wilber Judson has left Los Angeles for New Mexico.

Archibald Stark, of London, has been in Phoenix, Arizona.

A. W. Tait, president of the British Aluminum Co., is traveling in Canada.

A. L. Flagg has been appointed manager of the Kelvin-Sultana Copper Co. at Kelvin, Arizona.

D. W. Brunton has just completed a motor trip from Denver to Portland, Me., and back to Denver.

Dwight E. Woodbridge, of Duluth, Minn., has returned home after a visit to Salt Lake City and Butte.

R. Becker, president of the Stahlwerk Becker, Willichbei-Krefeld, Germany, has arrived in this country.

C. R. Corning has become manager of the Huanchaca company, the well known French concern operating in Bolivia.

M. B. Yung has opened an office for general mining work and assaying at 2 Gresson Street, Wanchai, Hongkong, China.

Ira B. Joralemon, mining geologist for the Calumet & Arizona Co., has been examining properties north of Phoenix, Arizona.

J. P. McFadden, formerly of Michigan, is now superintendent of the Surprise silver-lead mine, near Cody, Slocan, British Columbia.

Robert Scott is at Ione, Nev., installing one of his improved quicksilver furnaces, a 50-ton plant, for the Nevada Cinnabar company.

F. L. Sizer, general superintendent of the Mascot Copper Co., Dos Cabezas, Arizona, has been examining mines in the Santa Catalina mountains, north of Tucson.

Hon. T. W. Crothers, Canadian Minister of Labor, has sailed for England to study industrial conditions, especially in relation to coal mine strikes and disputes.

W. Berkeley Williams has been elected vice-president of the Alabama Co., which purchased the properties of the Alabama Consolidated Coal & Iron Co. at foreclosure.

George D. Blood, recently superintendent for the Silver King Coalition Mines Co., has been retained as consulting engineer for the Daly Judge Mining Co., at Park City, Utah.

W. M. Brewer, of Victoria, B. C., has gone to the Bridge River section of Lillooet district to investigate mining conditions there for the British Columbia Department of Mines.

John E. Rinta, after 10 years' active service as foreman and superintendent successively, with the Rambler-Cariboo silver-lead mine, Slocan, B. C., has been appointed manager as successor to W. E. Zwicky, resigned.

David H. Ladd, metallurgist of the Wallaroo & Moonta Mining & Smelting Co., of South Australia, was in New York last week. He left there for a short stay at Houghton, Mich., whence he will go to Germany on business.

Lindsay N. B. Campbell, formerly connected with the Vulcan Iron Works, Seattle, Wash., and the Northwest Steel Co., Portland, Ore., is now superintendent of construction at the West Coast Steel Works, Tacoma, Washington.

Prof. L. C. Graton is at Butte, Mont., with a corps of assistants, in connection with his study of the secondary enrichment of western copper deposits, an investigation to which the large producers of the West have jointly contributed.

C. Offerhaus, for four years past with the Paul Schmidt & Degraz Furnace Co., has resigned and has accepted a position with the Maschinenbau-Austalt Humboldt at Cöln-Kalk, Germany. He will have charge of the metallurgical department.

Walter H. Case, who has been manager of the Hazel Mining & Milling Co. property at Van Horn, Texas, has resigned and has been appointed consulting engineer for the same company. He will have his office at 512 Trust Building, El Paso, Texas.

Frank Williams, for a number of years superintendent at the South works, Worcester, Mass., of the American Steel & Wire Co., has been appointed superintendent of the entire works of the company at New Haven, Conn. He is succeeded at the South works by Edward Hentz.

H. S. Snyder, vice-president of the Bethlehem Steel Corporation, has returned from a trip to Scotland, where he had gone to consult with British ship builders over the building of a number of ore freighters which the company is planning for transporting iron ore from its Chilean properties to this country.

Charles Graham, of Middlesboro, Nicola Valley, B. C., superintendent for the Nicola Valley Coal & Coke Co., has been appointed superintendent for the Corbin Coal & Coke Co., at Corbin, Crow's Nest district. Robert Fairfoull, who has been overman at the No. 2 mine, Middlesboro colliery, is his successor as superintendent for the Nicola Valley.

Herr E. Schaltenbrand has resigned as managing director of the Stahlwerks-Verband, of Dusseldorf, popularly known as the German Steel Syndicate, and has taken a position with the Hohenlohe interests in upper Silesia. Herr Schaltenbrand has been very well known among leading steel makers of the United States by reason of his prominence in the affairs of the German Steel Syndicate.

OBITUARY

W. J. Evans died at his home at Bourne, Oregon, Aug. 19, of ptomaine poisoning. He was the chief owner of the Molly Gibson mine in Baker County, and was interested in other mines.

Thomas H. Martin, of Crosby, Minn., died in Chicago, Aug. 15, aged 45 years. He was born in Ishpeming, Mich., and when a young man entered the employment of the Cleveland Cliffs Iron Co. He remained with that company for a number of years. Some years ago he went to the Rogers Brown Ore Co., taking charge of a mine on the Menominee Range; two years ago he went to Crosby to take charge of the company's operations on the Cuyuna range.

Thomas G. Proctor was killed July 9 in an automobile accident at Oak Bay, near Victoria, B. C. He was 51 years old. He was born in England and came to the United States when a young man, and engaged in cattle ranching. In 1891 he went to British Columbia and took an interest in mining in the Kootenay district. He was interested in many mines and for some time past had been managing director of the Lucky Jim Zinc Mines, Ltd. He made his home at Nelson until two years ago, when he moved to Victoria.

Charles Austin Burcham, vice-president of the Yellow Aster Mining & Milling company, and one of the most prominent of mine owners in the state of California, suddenly died at the West Lake Hospital, Los Angeles, Aug. 15, aged 54 years. He was born in Vallejo, Calif., where he received his first schooling, and after the completion of his preliminary education he entered a business college from which he graduated. In 1880 he went to Southern California and engaged in the cattle business in San Bernardino County. In 1890 he directed his attention to mining. After five years' prospecting with varied success he with two partners discovered and located a prospect which was later developed into the Yellow Aster mine, which has made a notable record, and built the town of Randsburg. Mr. Burcham was active manager of the mine throughout its development, and was also interested in other local enterprises. He leaves a widow.

SOCIETIES

Old Freibergers in America—Dr. Richard Beck, president of the Freiberg Bergakademie, Freiberg, Saxony, has been in Canada attending the International Geological Congress. After the meetings of the Congress, Doctor Beck expected to visit several places in the United States before his return to Germany. A complimentary dinner will be given in honor of Doctor Beck at the Engineers' Club, New York, on Sept. 9, to which all former students are invited. For further particulars, Old Freibergers should write C. L. Bryden, 1701 Jefferson Ave., Scranton, Penn., secretary.

Canadian & American Peat Societies—A joint meeting of the Canadian and American Peat societies was held at Montreal, Aug. 18, about 20 members being present. P. L. Smyth, vice-president of the Canadian society, read a paper by President John H. Hoff, of New York, on the utilization of peat in agriculture, which was followed by a discussion on the use of peat litter as bedding for cattle and subsequently as a fertilizer. G. H. Condict, of Plainfield, N. J., treated of the utilization of peat tide land. B. F. Haanel, of the Canadian Department of Mines, dealt with the peat industries of Europe. Several other papers were presented. Visits were made to the peat fuel plants at Alfred, Ont., and Farnham, Que., after the meeting.

EDITORIAL CORRESPONDENCE

BUTTE—Aug. 21

The Strike of the Electrical Workers caused a further delay in the work of electrifying the Butte, Anaconda & Pacific Ry. The men were out 8 days and then returned to work under an agreement to submit their grievances to a board of arbitration composed of labor union men and representatives of the public utilities companies affected by the strike. For a time there was fear that the strike would result in closing all the mines and power companies, but the central labor unions and the Butte miners union refused to endorse the strike because it was called improperly and without notice to the companies and without authority from the national officers of the electrical workers.

SAN FRANCISCO—Aug. 20

Dredge Construction and Repairs in the American River and Yuba Basin districts have kept the shops busy and required the employment of a large amount of skilled and unskilled labor in the first half of 1913. There have been no completions of entirely new boats, but one of the old boats has been rebuilt and another overhauled and repaired in the Natoma field. No. 7 dredge was entirely reconstructed with new steel hull and went into commission in Blue Ravine May 12, No. 6 dredge, after thorough overhauling and complete repair, resumed digging on Sulkey Flat, July 31. Natoma No. 5 dredge, which sank starboard side down in 49 ft. of water June 8, was righted and ready for repairs July 18. Being an old boat, built in 1905, there was some doubt whether it could be righted intact. No damage resulted from the righting, and the damage done by sinking was confined chiefly to the twisting of the revolving screen, the breaking of some minor parts of the machinery, and the destruction of the principal part of the housing. The boat will be repaired and some new parts and improvements put in. Natoma No. 2 dredge, digging in the Fair Oaks field, had a hole punched in the starboard bow on July 3. The boat was prevented from sinking, righted and repaired and resumed digging within four hours. The hole was about 5 in. wide, large enough to have sunk the boat but for the prompt work of stopping the leak, which was done by cementing between the outer and inner walls of the hull. In the Poverty Bar field on the middle fork of American River the activity of the Guggenheim interests bears evidence of permanence in the recent filing of incorporation papers in Placer County, of the Yukon Gold Mining Co. and the commencement of construction of a 7½-cu.ft. bucket-elevator dredge. The Beaver Gold Dredging Co., operating on the west side of American River near Loomis, has made improvements and changes in the operating parts of the dredge, which permit the replacing of the land in condition for agricultural purposes. In Yuba Basin district the active construction of the steel hull of the new all-steel dredge Yuba No. 14 is in progress. The stocks were in place and the laying of the bottom plates of the hull was begun Aug. 5. It is expected that the dredge will be completed within five months. The delay has been due to the non-arrival of the steel hull, which was built in the East and shipped in parts ready for setting up. This will be the largest of all the gold dredges. The hull will be 155 ft. 6 in. long, 58 ft. beam, 5 ft. overhang. The dredge will be equipped with 16-cu.ft. buckets and designed to dig 65 ft. below the water line. The boat will operate on Yuba River about two miles east of Hammonton. A feature of this construction, of interest to all large mining operators requiring heavy hauling, is the use of a caterpillar engine and a train of five trucks with a capacity of 96,000 lb. at one load. The train will carry a single piece of machinery 60 ft. long. Yuba No. 5 dredge, one of the old boats operating near Hammonton, was sunk on July 31 in 60 ft. of water, going port side down. This is a 7½-cu.ft. dredge built by the Yuba Consolidated Goldfields in 1905. The sinking was caused by the bucket line going off the tumbler and landing on the hub. This caused a twisting and straining of the hull and made a leak that owing to the position of the ladder could not be repaired in time to save the boat from sinking. The new construction at Natoma and Hammonton, No. 7 and No. 14, is by the Yuba Construction Co. of Marysville. The repair work is by the shops of the operating companies, the Natomas Consolidated and Yuba Consolidated Goldfields. It is noticeable that the boats which have sunk were among the first built in these fields and that the sinking was due in all cases to the rotting of the wood in the hulls. The more important fact is that the machinery of the boats undergoing repairs has required little replacement, and in each instance the indications are that the life of the wooden hull boat will be approximately doubled without the cost of complete reconstruction. The life of Natoma No. 7 with new steel hull should exceed the period of seven years operation with wooden hull.

DENVER—Aug. 20

Labor Trouble in the Southern Coal Fields of Colorado seems imminent. At the meeting of the State Federation of Labor at Trinidad, Aug. 18, F. J. Hayes, national vice-president of the United Mine Workers of America, and who heralds himself as the representative of 400,000 union miners, delivered his ultimatum which is to the effect that unless the operators in district No. 15 recognize the union, a strike will be called. The fiat of the operators is that under no conditions will the men be negotiated with as unionists. The operators claim that less than half of the coal miners in Colorado are now paying dues to the union. A strike would be disastrous, as it would tie up a monthly pay roll of at least $1,500,000 and affect every industry in Colorado, and it will have no public sentiment at home to back it, for the elements of wages and hours of labor are not in dispute, and it will not therefore appeal to the sympathy of the people at large. It is hoped that wisdom will prevail, but both sides to the controversy are firm in their refusal to concede a point.

CALUMET—Aug. 23

The Lake Superior Strike was begun one month ago, having been called July 23. The event was marked by a parade of the strikers and an address by John Mitchell, the labor leader, who spoke in the morning at Calumet and in the afternoon at Hancock. Between 1750 and 1800 men were in line, with several women and children who were featured under the banner "What Papa is Striking For." The parade showed conclusively that the ranks of the strikers are gradually diminishing. The Federation has added another failure to its long list. The Calumet & Hecla is operating eight shafts and shipping about 1800 tons of rock to the mills daily, about 3000 men having signified their desire to go to work and the number is being daily increased. The Quincy is hoisting at two shafts, No. 2 and No. 6, and is shipping to the mill, as is the Champion property of the Copper Range Consolidated where hoisting is being done at two shafts. The Superior is shipping to the mills of the Lake Milling & Refining Co. At the Superior the men are being cared for at the property to avoid the possibility of interference from the strikers' pickets, and it is likely that similar arrangements will be made to take care of the men that have expressed their desire to go back to work at some of the mines at the northern end of the district. At the Mohawk, Ahmeek and Kearsarge branches of the Osceola Consolidated the Federation has been particularly strong, but the men are becoming dissatisfied with conditions and the future outlook and are applying for their former positions. In the village of Red Jacket, Wednesday evening, Aug. 20, a party of 20 strikers attacked a squad of deputies, two of whom were severely handled and if it had not been for the prompt arrival of the militia serious trouble would have occurred. Seven arrests were made as a result of the fracas.

MARQUETTE—Aug. 23

The Invasion of the Iron Ranges which the organizers of the Western Federation of Miners have threatened, stating that after the strike in the copper country is won by the Federation the steel interests will be compelled to recognize the organization, has not caused uneasiness, either among the mine workers or the operators. The threat is generally considered a bluff. The iron miners display no desire to invite labor trouble and it is declared that an invasion by outside agitators, such as took place in the copper country, would be resented and resisted. The mine workers are enjoying the best wages and working conditions in the history of the region. Furthermore, it is realized that, like those in the

copper district, the operators will never have any dealings with the labor organization. The mine workers at Ishpeming, the largest field on the Marquette range, have a union, but this is now in no way affiliated with the Western Federation of Miners and the members assert they are through with that organization for all time. There is reason for their attitude, for the Federation is endeavoring to take from them their business block on Cleveland Ave. and some $1500 in cash, money on deposit in one of the Ishpeming banks. The Ishpeming union surrendered its Western Federation charter one year ago, because of excessive assessments levied against the branch for the support of the agitators and for the maintenance of strikes in various parts of the country. Protests to the head officials were ignored. Instead, the levies continued to be made, and they were more than the members could afford to pay. Soon after the charter was surrendered the Federation officials started legal proceedings to obtain possession of the Ishpeming union's business block, its funds on deposit in the bank and all other property owned by the organization. The case is one in chancery and will be tried before Circuit Judge R. C. Flannigan at Marquette in September. Prosecuting attorney M. J. Kennedy, of Marquette County has been retained by the Ishpeming union. The Federation officials are basing their case on a clause in the organization's by-laws, printed in fine type, to the effect that when a subordinate union withdraws or becomes defunct, its holdings shall revert to the Federation. The officers of the Ishpeming union assert they did not know of the existence of this "joker" until after the withdrawal. In view of the fact that the business block was acquired by the Ishpeming union long before it became affiliated with the Federation, the members feel that the Federation has no right to claim either the realty or the bank deposits. The Federation never contributed toward paying for or maintaining the building, nor did it ever contribute anything toward the union's bank account. The block was paid for by assessing the members of the home union and with the rentals. The Ishpeming union bought the Cleveland Ave. property in 1898, and it became affiliated with the Federation six years later when the United Mineral Mine Workers' Association was absorbed by the Western organization. The union has an injunction against President Charles H. Moyer and Vice-president C. E. Mahoney of the Western Federation restraining them from entering its property or in any way interfering with the building or its contents. The property is in the name of the Ishpeming union and has been since the block was purchased by the miners.

DULUTH—Aug. 23

Stockpiles on the Vermilion Range owned by the Oliver Iron Mining Co. are getting low. From present prospects there will not be more than 20,000 tons altogether at these mines by the close of navigation. The Section 30 mine is the only independent shipper on the Vermilion, but from present prospects there will be two or three others next year, the Consolidated Vermilion, and Vermilion & Mesabi. It is expected that ore will be opened any day at the North American, and this property is a prospective shipper for 1914 also. The steamer "E. N. Saunders" took a cargo of 6500 tons of manganese ore from the Cuyuna-Mille Lacs mine, from Superior last Sunday for the Bethlehem Steel Co.

FLAT RIVER—Aug. 21

Settlement of the Strike is being attempted at a conference between the striking miners and operators with the state board of mediation, meeting at Farmington. The meeting was adjourned Aug. 21 with a prospect of bringing about a settlement. It is understood that an offer of a 20c. per day increase to the miners has been favorably received and may be the means of bringing about a termination of the strike. It is said the miners agreed not to enforce their demands that the unions be recognized by the operators. The operators, in connection with their 20c. offer, stipulated that further consideration of grievances be considered solely by the local union committees without the participation of the council of the Western Federation of Miners. Under the operators' propositions, all other demands of the union men are to be taken up in due course after the chief difficulty has been settled and the men are back at work. The strikers' demand that all striking miners be put back to work without prejudice and the operators have agreed to put all of them back that they are able to. The strikers are subjecting every vehicle in the lead belt to search in an effort to apprehend imported strikebreakers. Vehicles bearing women have not escaped the espionage, and several wagons and automobiles containing only women have been subjected to search by the miners. It is generally thought that a settlement must be effected at once to prevent the indefinite suspension of at least three companies. Water has already risen above the pumps in shafts owned by the St. Joseph Lead Co. Mines of the Desloge Consolidated Lead Co. and the Doe Run Lead Co. are in extreme jeopardy and it is only a question of hours until they will be beyond the possibility of immediate reopening. The Federal Lead Co. is operating its pumps with strike breakers imported from St. Louis. A coterie of St. Francois County officials proposed that negotiations be opened favoring a settlement with the Doe Run, St. Joseph and Desloge companies, leaving out the Federal and the St. Louis Smelting & Refining companies. The latter are Guggenheim corporations, and considerable feeling against them is being manifested on account of the importation of strike breakers. The St. Louis Co. is barely operating its pumps with its own men. Bathing is a forgotten luxury in Flat River, Bonne Terre and Leadwood, where the water supply has been cut off by the suspension of pumping. A sudden demand for coal-oil lamps was created when electric currents were stopped. Four passenger trains on the Mississippi River & Bonne Terre R.R. have been taken off. Union officials have asked the strikers to abstain from drinking. As a result the saloons of Bonne Terre, Elvins and Farmington are receiving less patronage from the miners than before the strike. Very little disorder is noticeable. The entire district is virtually without police protection. Flat River, an unincorporated town of 5000, has a police force of two men, a constable and a deputy sheriff. Several deputies have been sworn in to guard property of the Doe Run Lead Co., situated outside the business and residence section, and also property of the St. Joseph company at Leadwood. Bonne Terre, about the size of Flat River, is also unincorporated and has only two or three peace officers. All of the mining towns with the exception of Elvins are without jails. Elvins, with a population of 2500, is incorporated. The companies have always fought the incorporation of the other towns. The Federal Lead Co.'s shaft No. 7, in Flat River, was abandoned by the pumping crew, composed chiefly of strike breakers. The crew was not large enough to keep steam up and cope with the water. It is the first one of the Federal's shafts to be abandoned. The mine will be completely flooded within a few hours. Union men deserted the gas and water plants at Bonne Terre, Aug. 17, in sympathy with the striking lead miners. The union men at the gas plant walked out after giving the public notice they would do so unless the electric power generated for commercial purposes was discontinued for use to pump the mines. [Later dispatches dated Aug. 26, state that the operators have granted an increase in wage, the union will not be recognized, and the men will return to work at once.—Editor.]

VICTORIA, B. C.—Aug. 15

Troops Have Been Called Out by Attorney-General Bowse. Militia and regulars to the number of 1000 have been sent to Nanaimo, Ladysmith and Extension in the strike zone on Vancouver Island. At Extension, 40 non-union miners barricaded themselves in a tunnel and a battle ensued between them and the strikers. One non-combatant was shot and fatally injured. Alexander McKinnon, a non-union man, was badly injured at Ladysmith by dynamite, and is not expected to live. Several non-union men were beaten up by the strikers, while numbers of them, including some of the mine bosses and superintendents escaped to the woods. At Extension eight buildings, including the tipple and approaches to the mine, are reported burned, also three big motors, 35 cars and considerable equipment. One of the slopes in the mine is on fire, but the fire broke out before the riot. Twenty-five special police, who were hurried over from Vancouver when news of the disturbance was first received, were met at the wharf by the union miners, stripped of their badges, revolvers and handcuffs and sent back on the boat by which they arrived. Many of the miners at Ladysmith are foreigners. Four leaders of the strikers have been arrested at Cumberland and placed in the jail at Nanaimo.

The wives of the strikers have been active, encouraging the miners in their attacks on the coal mining companies' properties. At Nanaimo they closed up the office of a newspaper that they considered had been unfair to them in its reports of the strike troubles. Since the strike commenced the Cumberland mines have been operated by the aid of Chinese miners, but fearing race riots, these men are reported to be quitting work. The disturbance is likely to lead to an investigation of the unionists' grievances, which the coal companies have been avoiding and which the provincial government has hitherto refused to grant. No news of any fresh disorders has been received since the troops arrived on the scene, and it is likely that quiet will now prevail. Between 4000 and 5000 miners are involved in this strike. [Later advices state that some of the mines are resuming operations recognition of the union having been conceded.—Editor.]

THE MINING NEWS

ALASKA

IDITAROD DISTRICT YIELD this season will be, according to estimates, $2,500,000. Dry weather and a consequent shortage of water has interfered to some extent with operations. Most of the production will come from a few large operators. Riley & Marsten, on Flat Creek, are employing 200 men, while another company is working 120 men on Discovery claim.

RUBY DISTRICT PRODUCTION up to July 1 was $200,000. The present output is reported to be at the rate of $150,000 per month, which will give an output for the season of $600,000. There are no large crews at work, most of the mining being done by three or four men working together. Poorman Creek, 60 miles from the town of Ruby, promises to become the banner creek of the camp.

CIRCLE DISTRICT reports a continuation of the unusual water famine that has been felt so keenly this summer in every camp in the Yukon valley and also in Nome. On Mastodon Creek every plant has been forced to close down, with the exception of the Elmer dredge, which is reported to be having a prosperous season. An important recent discovery of pay is reported from a tributary of Hope Creek, where Carl Anderson and partners are said to have found ground averaging a little more than $1 per sq.ft. of bedrock.

THE HOPE AND SUNRISE DISTRICTS are experiencing a quiet boom. In 1896 this district, known as the Cook Inlet district, was the scene of wild mining excitement. Men rushed in from all parts of the world, following discoveries on Bear, Palmer and Resurrection Creeks. The country was over-prospected, and when the Klondike stampede took place it was deserted. Claims reverted to the Government. Now, owing to systematic prospecting, there are some good-sized crews at work on their own grounds, making better than wages, and some who are in the coarse pay.

RHOADS & HALL (Cleary)—The latest developments on the 140-ft. level of the winze have been unsatisfactory. The vein is wider than in the upper levels, averaging 3 ft., but the ore is too low-grade to yield a profit under the present high cost of mining. The sinking of a vertical shaft has been postponed indefinitely.

ARIZONA

Gila County

AN ELECTRIC SMELTING TEST, the first test of an electric-smelting furnace in Arizona was made in Globe a few days ago by Raymond S. Wile, of the Pittsburgh Electric Furnace Co. In smelting Copper Reef ores the slag contained 0.35% copper. About 3500 kw. per ton of charge was required for smelting. The furnace has a capacity of 15 tons per 24 hr., not 5 tons as stated in a previously published item. The furnace is of the resistance, vertical-shaft type, 6 ft. high, and is lined with magnesite. The orifice is 22 in. in diameter at the top and tapers down to 20 in. at the bottom. A stationary electrode is fixed in the bottom of the furnace. At the top a 5-in. Acheson graphite electrode is suspended and operated by a winch. The heat is started by an arc, and as the charge melts the upper electrode is withdrawn partially, remaining immersed in the charge just sufficient for the resistance of the charge to maintain the necessary heat. The molten bath is always kept at a height of 3 ft. Near the bottom of the furnace are two spouts, the upper one for drawing off the slag and the other for copper.

INSPIRATION CONSOLIDATED (Miami)—The mill work is well under way. The first portion to be begun is the eastern corner where the three-story warehouse walls are rising. At present only one of the large concrete mixers is in operation, but the installation of another will double the amount of construction work in the near future. Excavation for the 600-ton flotation test mill has been completed and pouring of concrete will begin early in September. The present rate of construction calls for 150 cu.yd. of concrete daily. Constantly recurring reports of smelter construction at Burch, a station on the Arizona Eastern R.R., four miles from Miami and six miles from Globe, have no foundation in fact. It is generally understood, however, that the International Smelting & Refining Co. will build a smeltery in the district in the near future, despite the fact that the Miami Copper Co. has entered into a new 10-year contract with the Cananea company for reduction of its concentrates.

Mohave County

GOLD IN KINGMAN was discovered a few weeks ago. A piece of rock was picked up on Oak St., which roused the interest of the finder. Later prospecting disclosed a small vein crossing the street from which a sample of ore was taken right on the surface. This sample assayed $97 per ton in gold.

HORSHOE (Cerbat)—It is expected that work here will be started immediately; Frank O'Dea is owner.

PINKHAM (Kingman)—Drifts are being driven on the 220- and 320-ft. levels; good ore being found on both.

SAVANIC (St. George, Utah)—This property is situated north of the Colorado River about 20 miles south of St. George. Development work is opening a large shoot of copper ore.

WHITE ELEPHANT (Cerbat)—It is said that the 200 level is in the best ore yet encountered in the mine. The Pacific Investment Co., which is operating the property, has purchased a 2-ton Gramm auto truck for hauling ore to the railroad, four miles away.

VALLEY VIEW—At the bottom of the shaft a shoot of good shipping ore has been found. Work has been suspended temporarily pending the arrival of heavier timbers required by the bad ground in the bottom of the shaft and near the old workings.

NEVADA-ARIZONA (Hackberry)—Work is progressing rapidly on the new mill. It is expected that it will be in operation within a week or 10 days. Much development work has been done within the last few months. The Roosevelt tunnel is in more than 700 ft., much of that distance in good milling ore. One shoot of ore cut by this tunnel is more than 200 ft. long. A contract is to be let to sink the Lucknow shaft below the 200-ft. level.

CALIFORNIA

Amador County

GRITTON (Volcano)—An attempt to reopen this old gravel claim is being made. The purpose is to extend the tunnel into the main channel of Shake Ridge. Recent prospectings proved the presence of platinum in the old tailing.

KENNEDY EXTENSION VS. ARGONAUT (Jackson)—The trial has been set for Sept. 15. The complaint was filed Dec. 1, 1909, by H. G. Perry, secretary of the plaintiff company. The complaint charges that the Argonaut has mined 50,000 tons of ore from the ground of the plaintiff, valued at $500,000, and asks for $200,000 damages in addition. The legal question is one of extralateral rights.

Butte County

KLONDYKE GRAVEL MINING CO. (Clipper Mills)—It is reported that manganese ore has been disclosed in this mine.

STEIFER MINING CO. (Magalia)—A new concrete dam is being built across the west branch of Feather River, one mile above the dam built three years ago. The new dam will give 100 ft. additional head to the water used for mining. During the present season the diminished supply of water has been unequal to the demand for power. The increased head will enable the company to operate in dry seasons.

REINER (Stockton)—This mine at Altaville, one mile from Angels Camp, has been closed down temporarily. John C. Benson, manager, states that the closing down was due to the necessity of rebuilding the mill which was burned last year, before proceeding further with the extraction of gravel. He says that rich pay gravel has been disclosed in a winze from the drift at the depth of 400 ft. It is reported that the pay checks received by the miners July 15 were debited to the merchants who cashed them, by the bank at Angels Camp because there was not sufficient funds in the bank at Stockton on which they were drawn; but that it is believed the matter will be straightened out, and that the mine will resume operation when the money can be raised to rebuild the mill.

Inyo County

BISHOP CREEK (Bishop)—The mine and mill have been closed down. It is reported that Gaylord Wilshire, manager, states that he expects to resume operations within 60 days. A 20-stamp mill was recently built. A pumping system was also installed, and electrical connections made. In fact, the equipment is said to be complete in every detail. A cyanide plant was ordered, and the machinery is reported to be on the ground ready for installation. The orebodies are said to have been sufficiently developed to justify the expense of equipment; the ore is of medium grade. Algernon Del Mar has resigned the position of superintendent. He completed the work of installation with the exception of the cyanide plant.

Kern County

SILVER FLAT MINING CO. (Inyokern)—This recently discovered property, 10 miles east of Inyokern, has been taken over on bond and lease by J. F. Flood, of Los Angeles. Two veins have been opened up, each 5 ft. in width, one of them carrying a pay streak 18 in. wide. The ore assays $50. Abundant water can be developed at a depth of 80 feet.

LAST CHANCE CANYON—Placer grounds embracing 29,000 acres, and including the Sunrise, Sunset, Last Chance, Mesa Spring and Joshua placer claims, in the Black Mountain mining district, have been secured under option by Douglas & Fisher, of Los Angeles. These placer deposits were worked dry, with not altogether satisfactory results. Water is now being developed in Nugget Gulch.

KING SOLOMON (Randsburg)—A recent cleanup made at the Red Dog mill of 45 tons of ore showed an average recovery of $60 per ton. This ore was mined from what is known as the Shipsey ground. Both hoists are running. Ore is also being mined from the Lamberson shaft. A cleanup of 10½ tons from the Nosser-Murphy lease is reported to have averaged $110 per ton. The shaft on this lease will be deepened to the 200-ft. level.

Tuolumne County

APP CONSOLIDATED MINING CO. (Jamestown)—The repeated efforts of Daniel Manning to realize on a judgment for $17,500 against this and other companies and the late W. A. Nevills, has again failed in the superior court of Fresno County. Manning was injured in the App mine in February, 1902. He obtained judgment for $5000 damage. The case was reversed on appeal and in the second trial he obtained judgment for $17,500.

COLORADO

Clear Creek County

LUCKY FIND (Dumont)—A crosscut is being driven to cut the vein 80 ft. below the upper workings.

CENTRAL CAPITAL—Development will soon be resumed on this property on Griffith and Alpine Mountains. A vein of lead-zinc ore was encountered 500 ft. from the portal of the crosscut tunnel, which will be thoroughly developed by the operators now in control of the mine.

COLUMBUS (Idaho Springs)—An encouraging strike has been made by lessees in this property in the Russel district. The shaft is 440 ft. deep. On account of the discovery on the 240-ft. level, the other levels will be repaired and placed in working order so that the property may be thoroughly explored. It is the intention of the operators to install additional equipment.

GOLDEN EDGE (Idaho Springs)—This property on Seaton Mountain, is being developed through the Newhouse tunnel by J. P. Ruth. Stoping is now in progress on a 3-ft. vein of milling ore and carload shipments have been started. The ore is being delivered to the Argo mill at the portal of the Newhouse tunnel. The milling ore is accompanied by a streak of smelting ore, which is sorted and sacked for shipment to the smeltery.

JOE REYNOLDS (Idaho Springs)—During the last few weeks prospecting with a diamond drill has been in progress in this property on Columbia Mountain, resulting in the discovery of new ore on the fourth and seventh levels. The property was shut down five years ago on account of litigation which has recently bees settled. The Joe Reynolds company has secured a right-of-way through the Leasch tunnel, and the tunnel workings are being retimbered and placed in working order.

Pitkin County

MOLLIE GIBSON (Aspen)—This old mine is now in shape for production again, having been unwatered by the Smuggler Leasing Co. by a drift from the Free Silver shaft to a point below the Mollie Gibson. It is stated that there are large bodies of ore in the lower levels, and with the completion of the Mollie Gibson shaft this ore can be profitably mined.

San Juan Region

GOLD KING (Gladstone)—The gravel deposits below the old Gold King mill, in the gulch leading out of Gold King Basin north of Ophir Loop, are being successfully sluiced by W. G. Gibson and William Martin. Considerable gold, amalgam and quicksilver is being recovered.

BALLARD (Telluride)—J. C. Weller, owner of this property on Ballard Mountain, has purchased the Mammoth mill, which was erected in Bear Creek Gulch, about half a mile above the old Bear Creek mill on the Mammoth property, and used only a short time. The building and machinery will be moved to the site of the new Ballard mill below the Junta mill, where it will be erected and placed in working order before winter. The new plant will include stamps, amalgamating plates, bumping tables and Frue vanners. It is proposed to erect a two-bucket tramway between the mine and mill. The profile of the proposed tramway has been surveyed.

CARRIBEAU (Ophir)—J. B. Olson and Ralph Hanson have secured a bond and lease on this group. The purchase price is placed at $150,000. The first payment is reported to have been made. The property includes 23 lode claims, a 20-stamp mill, mine and mill buildings, a tramway connecting the mine and mill, and developed water rights capable of furnishing 140 hp. The water power and milling equipment are practically in working order and a substantial quantity of milling ore is reported to be blocked out in the mine. The Montezuma and Carribeau properties are the most extensively developed of the group and are being reopened and placed in working order. Alterations and improvements are being made in the mill.

Teller County

EL ORO GOLD MINING CO. (Cripple Creek)—A rich strike has been made in the Eclipse tunnel on Battle Mountain. In cleaning out an old drift on the tunnel level it was found that the walls had caved exposing a vein.

MARY NEVIN (Cripple Creek)—A four-drill compressor is being installed at the main shaft of this mine on Rosebud Hill by the Kolman Leasing Co. The mine is producing steadily and with machine drills the output will be increased.

MICHIGAN

Iron

M. A. HANNA CO. (Wakefield)—Preparations are being made to strip the Wakefield mine, which was recently taken over from Michigan men who own the leases. The overburden is estimated to be 65 ft. thick, and the stripping contract will be a large one. The orebody is extensive and was located but a few months ago. It is believed that the property will be in shape to ship some time next season.

ATHENS (Negaunee)—The work of sinking the shaft is going ahead rapidly, but it will be several years before ore will be coming to the surface. The property is being opened by the Cleveland-Cliffs Iron Co., but Pickands, Mather & Co. have an interest in the leases, although that company will not take any part in the operations. The shaft will be sunk to a depth of about 3000 ft., and will be lined with concrete to the bottom. The drills were still in ore at 2280 ft., when the holes caved. The mine will probably be connected on one or two levels with the Negaunee mine, which is a short distance to the north.

OLIVER IRON MINING CO. (Crystal Falls)—It is now admitted that a body of ore has been located by drills that have been in operation to the south of Crystal Falls for several months. The find was made on lands owned by the Michigan Land & Iron Co. The Oliver company has held a lease on this company's holdings for more than a year, and drills have been in operation at numerous places, but no information has been given out from any other section than the Crystal Falls field. The drills that were used in the Witch Lake and Fence River districts for more than a year have been removed the results not being obtainable.

MINNESOTA

Cuyuna Range

BRAINERD-CUYUNA MINING CO. (Brainerd)—A drill hole is now being put down on the proposed shaftsite. A spur will be laid in to the property by the Northern Pacific, the main line of which crosses the property.

ADAMS (Oreland)—A station is now being cut for the pumps. Two steam pumps and one electrically driven pump will be installed, each of approximately 1400 gal. capacity. It is necessary to drift 200 ft. from the shaft to reach the orebody, which drifting is now in progress.

ROGERS, BROWN ORE CO.—This company has shipped, to Aug. 14, a total of 480,000 tons this season from its three shafts, Armour No. 1, Armour No. 2 and Kennedy; 365,000 tons of this went to the Iroquois Furnaces, Buffalo, N. Y., of the Rogers-Brown company, and the rest to various independent companies.

DELL DEVELOPMENT CO.—The Jones-Ardis furnace plant of this company will be situated at Aitkin. The new furnace will be vertical instead of horizontal, as the previous ones have been, and it is hoped successfully to extract the manganese from the low-grade ores of the North Range of the Cuyuna district. The plant will have track connections with the Northern Pacific and the Soo Line.

IRONTON—(Ironton)—This mine, which is owned by the Duluth-Cuyuna company was formerly opened a few days ago, when several hundred Duluth people, many of whom are stockholders in the company, visited the mine. Five cars of ore were loaded for shipment. The ore produced at the Ironton is similar to that mined at the Armour No. 1, which is a near neighbor. The deposit is a large one and the shipments next year should be large as the property is well equipped with machinery.

Mesabi Range

AT THE NEW NORTHERN PACIFIC DOCKS at Superior, Wis., the first shipment of ore was received Aug. 19 when 7000 tons were dumped into the pockets. Construction work is still in progress, and the ultimate cost will be about $2,000,000. The dock is 647 ft. long, 20 ft. high, with a 4200 ft. approach. It has 152 pockets of 350 tons capacity each, being 50 tons more than any other dock now in use. Is of fireproof construction, being concrete and steel entirely.

INLAND STEEL CO. (Crosby)—The Thompson mine of this company, formerly operated underground but now being stripped, has one steam shovel at work; 700,000 cu.yd. of overburden are to be stripped. The shaft will be used later for removing a portion of the orebody which cannot be stripped.

OLIVER IRON MINING CO. (Hibbing)—It is believed that this company will in the near future drain the water from Carson Lake, as it is known that a large orebody exists under the lake. When the water has been removed the property will be stripped preparatory to mining next year. The lake is not extensive and the task will not be a great one.

MISSOURI

Joplin District

A GOOD RUN OF ZINC has been found at Belleville, northwest of Joplin, by a company of Webb City operators. One shaft showed a 12-ft. face of ore, and the company is working in an old shaft now, hoping to strike the same vein and operate the two shafts. Only zinc is found.

SCOTT & GREGG (Galena, Kan.)—This company has just opened up an old-time bonanza on the Templar ground.

LULU V. (Spring City)—A modern concentrator has just been completed on this property and will begin operations this month. This is the latest developed mine in the Spring City camp.

MORGAN & CO. (Spring City)—A new prospect has been opened on the E. G. Doane land and zinc-silicate ore carrying from 40 to 47% zinc is being taken out in large quantities. The ore found at a shallow level occurs in large chunks and layers in a red clay formation.

TEN PER CENT (Joplin)—This company has encountered good zinc and lead on a 40-acre lease of the Howard Murphy land at Tanyard Hollow. Several drill holes showed ore. One subleasing company has discovered calamine at the 50-ft. level and will install hand-jig equipment.

ISHERWOOD (Carl Junction)—Continued increase in the turn-ins from this mine have prompted the company to plan the erection of a mill. Only hand jigs are used now, but the mine is considered to be one of the richest ever opened at Carl Junction. Huge chunks of almost pure ore were taken out a few weeks ago.

PINNACLE (Oronogo)—Recent development work has resulted in a larger output of both zinc and lead ore. An old shaft, that has been idle for several years, is being worked again, and the ore conveyed over a tramway to the mill, affording sufficient supply to keep the plant in operation. The richest ore is found at the 240-ft. level.

MOORE & CO. (Joplin)—This company has purchased the old Monitor mill, and will have it removed to a lease on the Spencer land at Thoms Station. The mine is being operated under the name of the Texas Mining Co. Nine drill holes, put down during a recent prospecting campaign, showed ore at a depth of 153 to 165 ft. When the shaft had reached the 160-ft. level, three drifts were cut, each in ore. Hand jigs have been used, but were found inadequate.

EDNA LEAD & ZINC CO. (Galena, Kan.)—The development of an old producing tract of 40 acres in the southwestern part of the camp where for many years shallow operations have been carried on, has been undertaken. The company has drilled the ground for deeper level work, has overhauled the 150-ton concentrator and pumped out the mine. Besides working the deeper levels, the company has subleased the shallow levels to nine different companies, so that the tract is now one of the most active in the entire district after an idleness of several years.

MONTANA

Butte District

BUTTE & ZENITH (Butte)—The shaft will be sunk from its present depth of 500 ft. to the 1000-ft. level. The property is three miles west of Butte.

Beaverhead County

HECLA (Melrose)—Development work is being carried on steadily, and with the completion of the concentrator now building, mining operations will be commenced on the ore blocked out. The Longmaids, of Helena, secured the mine about a year ago and have done a large amount of work preparing it for operation.

Deer Lodge County

SILVER CHAIN (Anaconda)—Butte men who have been operating this silver mine since last autumn on a lease, recently made a shipment of ore to the Washoe smeltery. The property is in Olson Gulch, and has been idle since 1899, previous to which time it produced a large amount of silver ore.

ORO FINO (Georgetown)—Ore assaying from $15 to $20 per ton was recently encountered at a depth of 20 ft. in this property. The extent of the discovery has not yet been ascertained, but drifting on the shoot is being carried on as rapidly as possible. Development work is also being done on the 100-ft. level.

SOUTHERN CROSS (Georgetown)—About 100 men are employed at this property of the Anaconda company, and 100 tons of ore are being mined and shipped daily to the Washoe smeltery at Anaconda. Extensive development work is being done on the 500-ft. level, and it is probable that the ore shipments will be largely increased in the near future.

Park County

MONTANA CONSOLIDATED GOLD MINING CO. (Livingston)—George B. McCaron, of Livingston, has been appointed receiver of the property, mines, mills and water power plant of this company, incorporated for $10,000,000 and having property alleged to be worth $500,000. The petition alleges an attempt by J. T. Barney, of Chicago, to deprive stockholders of properties and charges him, as secretary, with obtaining a sale of the property by fraud.

Powell County

BIG DICK (Elliston)—The Butte & Elliston Mining Co., which is operating this property in the Nigger Hill district, has shipped a compressor, boiler and other machinery from Butte. It is expected that the tunnel, now being driven, will be completed by Nov. 1. Shipping of ore will begin by Nov. 15. The company owns about 100 acres of ground in the group.

NEVADA

Clark County

QUARTETTE (Searchlight)—The 40-stamp mill and power plant caught fire at 2 a.m., Aug. 20. The flames were discovered by the night watchman, but they spread with such rapidity that within 20 min. the entire plant was in ruins. Hard work on the part of the miners was all that saved the assay office, stables and outside buildings from the flames that spread on all sides. Timbers supporting several cyanide tanks close to the mill were partly burnt away, causing one of the large tanks to topple over and weakening the supports of the others. The mill had been shut down for a cleanup. The loss will be about $100,000 with small insurance. The cause of the conflagration is unknown. The mill will be rebuilt at once and steps have been taken to lease the Cyrus Noble mill for use in the interim.

Lyon County

MASON VALLEY MINES CO. (Thompson)—During the quarter ended June 30, 1913, 31,336 tons of ore were produced. The smeltery treated 59,494 tons, producing 4360 tons matte, which yielded 3,587,693 lb. of refined copper. The financial results are as follows: Gross profit, $86,670; less depreciation, $24,427; deferred charges, $3644; bond interest, $14,047; total, $42,119; net profit, $44,551. The foundations for the two new converters are finished and the converters will be installed at once. A switch on the railroad is being extended to the power house to facilitate the installation of the blower and motor. At the mine a new Word drill sharpener is being installed.

Nye County

PRODUCTION FOR FIRST SIX MONTHS OF 1913 of Tonopah mines was: Tonopah Mining Co., 87,455 tons; Tonopah Belmont, 81,740; Montana Tonopah, 26,156; Tonopah Extension, 28,071; West End, 25,682; MacNamara, 13,602; Jim Butler, 10,849; Midway, 1530; North Star, 2268; Tonopah Merger, 2113; and Mizpah Extension, 25 tons, total 279,491 tons of $5,608,580 gross value. The production for the first six months of 1912 was 221,500 tons, gross value, $4,630,000.

TORO BLANCO (Manhattan)—An oreshoot of good grade was struck in the shaft on the 245-ft. level. An increased flow of water was also encountered. On the Case lease a large shoot of milling ore has been opened in the winze from the tunnel level.

Ormsby County

THE BULLION TAX and other questions relating to mine taxation were discussed by the tax commission and a delegation representing the mine owners of the state, composed of Albert Burch, manager of the Goldfield Consolidated, John E. Kerchen, of the Tonopah Extension, A. H. Howe, of Goldfield Consolidated, Henry M. Hough, attorney, Fred J. Siebert, engineer of the Goldfield Consolidated, C. O. Bradley, of the Pittsburgh-Silver Peak, Frederick Bradshaw, of the Tonopah Midway, and W. B. Alexander, Sec'y of the Mine Operators Association. The delegation appeared before the Tax Commission at Carson City. The chief point urged was that a liberal allowance for deterioriation of milling and smelting plants should be allowed, so that by the time a mine is worked out, or the plant has become obsolete, it will not be paying taxes in proportion to its original cost.

White Pine County

BOSTON ELY MINING CO. (Kimberly)—Rapid progress is being made in the west drift at the 1100-ft. level. The west contract of the porphyry is being driven to and the face of the drift is now about 800 ft. from the shaft.

COPPERMINES CONSOLIDATED CO. (Ely)—No announcement has been made locally of this company's plans. At the Giroux mine the force has been greatly reduced since the first of the month. Indications point toward stripping the Morris orebody with steam shovels. The plant at the deep Giroux shaft was steamed up temporarily to permit an examination of the workings by the new management. It is not probable that the pumps will be started in the near future. This company is profiting from the Nevada Consolidated operations at the Liberty pit. In order to get into the pit the latter company was obliged to secure a right-of-way the full length of the Oro claim from the Giroux company, which reserved all rights to ore extracted in the process of grading approaches, etc. In fulfillment of this agreement the Nevada Consolidated in 48 hr. loaded out 54 cars of Coppermines ore, averaging better than 1.75% copper. This appears to point to an easy way for the Coppermines company to carry out its contract with the Steptoe works and incidentally reduce its mining costs from $2 to 50c. per ton. At the Minnesota, which was the original mine of the Coppermines company, developments in the last year have been extremely favorable. A long drift has been driven from the shaft to the east, which has more thoroughly prospected the ground drilled with Keystones a few years ago. The drift appears to be skimming the top of the enriched zone at about 400 ft. below the surface, and the grade of the ore is rather better than indicated by the drilling. Preparations are being made to sink a new working shaft, which can now be more favorably located than was the old shaft.

NEW MEXICO

Socorro County

DEADWOOD MINES (Mogollon)—A new body of ore has been cut by the levels south of the main shaft, toward the Sunburst mine, one of this company's properties. The mill is treating from 350 to 400 tons of ore per week. From the last clean-up 600 lb. of gold and silver bullion and 1500 lb. of concentrate were shipped. A considerable tonnage of custom ore is treated for developing companies.

SOCORRO MINING & MILLING CO. (Mogollon)—Two additional oil engines of the De La Vergne type were recently installed. A proposition to light the business houses of Mogollon with electricity is being considered. Some of the best-grade ore is coming from the 800- and 900-ft. levels. The mill is treating 175 tons daily. In July 2 tons of gold and silver bullion and a large amount of high-grade concentrate were shipped, breaking all previous records in output.

C. H. PUTNAM ENGINEERING CO. (Mogollon)—This company of Los Angeles has been operating the Little Charlie mine, one of the Mogollon Gold & Copper Co. properties, under bond and lease, for over a year, during which time several thousand tons of excellent ore have been mined, part of which was shipped direct to smelter and the rest to local custom works. A 25-hp. crude oil engine and electric hoist have been installed. From 20 to 30 tons of ore are shipped daily.

LINCOLN MINING & DEVELOPMENT CO. (Mogollon)—This company, successor to the Enterprise Mining Co., is preparing to do extensive development work, chief of which will be sinking the shaft, which reached water level some time ago when work had to be discontinued on account of the excessive inflow. A pump will be installed. It is rumored the mill will be altered to accommodate custom ore that is available from properties developing in the north side of this district.

PACIFIC MINES CO. (Mogollon)—A large amount of machinery for development work is on the ground for immediate installation, including compressor, air drills, crusher, motors and transformers, electric hoist, etc.; a 50-hp. motor for driving compressor is en route from Silver City. Current will be furnished by one of the local companies. The main tunnel is now in 900 ft. and the new shaft has reached a depth of 240 ft. Drifts are being driven on second and third levels; the vein is 5 to 8 ft. wide and assays from $15 to $18 per ton. All ore taken out in development is sent to one of the local custom mills; 120 tons were shipped the first week of August.

OREGON

Baker County

THE COMPLAINT AGAINST THE RAILWAY made by Arthur L. White, owner of the Ben Harrison mine against the Sumpter Valley Ry. Co., has been dismissed by the State Railroad Commission which found that it was without jurisdiction, but recommendations were made to the Interstate Commerce Commission in favor of the contentions in the complaint. White charged that the railroad's charge of 15c. on concentrates from the mine to Baker was exorbitant.

BEN HARRISON (Granite)—Concentrates are shipped a distance of 21 miles by team, to the railroad at a cost of $8 per ton. A 100-hp. gasoline tractor which will haul several cars and in that way reduce the cost of getting ores and concentrates to the railroad will be purchased for hauling in the future. The tractor is being shipped from Ohio.

Lane County

WEST COAST MINES CO. (Oresco)—The sale of the properties of this company, the most highly developed in the Bohemia district, is reported. The purchasers are Washington men and besides taking over these properties it is stated that they will build custom reduction works for treating the low-grade ores of the camp. Herbert Leigh, of Eugene has instituted a suit in the circuit court against the company to restrain it from selling the property till they have paid him $5000 which they agreed to do in case he showed the management where there was a rich orebody, which he did. He states that the company has been milling this ore for some time and that he has not received his pay.

UTAH

Juab County

TINTIC DELMAR (Provo)—Drifting is being done in a vein showing mineralization at the bottom of a winze 100 ft. below the tunnel level. The work is 185 ft. from the surface.

SOUTH UTAH MINES (Newhouse)—Rumors relative to a reorganization have been denied by an official of the company. The July production is expected to reach 230,000 lb. of copper. About 8000 tons monthly are being handled.

GOLD CHAIN (Robinson)—One of the largest shoots of ore ever opened in the property is being mined on the 700. The ore is medium grade, carrying copper, with some silver and gold. It is said with sorting to bring $20 per ton.

IRON BLOSSOM (Eureka)—The ore recently opened in a vein paralleling the main fissure is 10 ft. wide on the 500-ft. level, and is thought to be making to the north and south. Stoping has been begun. Prospecting is being done from the 1900-ft. level of the No. 1 workings, with no new developments.

Summit County

PARK CITY SHIPMENTS for the week ended Aug. 15 amounted to 3,071,940 lb. The Daly West, Daly Judge, Silver King Coalition, American Flag and Silver King Consolidated made shipments.

MINES OPERATING CO. (Park City)—This company has a lease on the old Ontario mine and has published a statement regarding smoke conditions at its milling plant. This was in reply to some criticism which had been made as to the escape of chlorine gas. The company uses the old Ontario mill which has been remodeled. Roasting with salt forms chlorine which is removed by suction fans. The gases contain little injurious constituents such as sulphurous fumes, arsenic or oxides of the metals: Chlorine is the only element present in sufficient quantity to be injurious to vegetation. During the last few weeks a large condensing chamber has been built for the removal of the chlorine. The smoke from the roasters passes through a spray of cold water which absorbs the gas. Experiments are in progress with a view of making all improvements possible, that will better conditions about the plant, and the amount of chlorine produced has been decreased.

WASHINGTON

Ferry County

REPUBLIC MINES CORPORATION (Republic)—The properties of this company have passed into the control of J. L. Harper, former general manager of the company, and his associates, under a two-year bond, for $600,000. The first payment of $100,000 is to be made Jan. 1, 1914, the second, of $200,000, Aug. 15, 1914, and the remaining $300,000 is to be paid on or before Aug. 15, 1915. The purchase contract stipulates, however, that payments may be made on a royalty basis of from 10 to 40% of the net smelting returns from shipments from the mines, depending upon the grade of the ore, but that the installments must be made as agreed, regardless of whether a sufficient amount is produced by the properties. The purchasers assume all the indebtedness of the Republic Mines Corporation, aggregating $81,000, including a $25,000 mortgage held by A. B. Willard, president of the company.

Mason County

PROSPECTORS IN THE OLYMPIC RESERVE have opened veins of high-grade manganese and copper ores. The vein are from 20 to 500 ft. in width. At the scene of the present operations on the north fork of the Skiokomish River sinking has been carried to a depth of 90 ft., and copper ore is found in large quantities under the manganese. Twenty-five tons of ore are being taken out per day at the present time, and shipments will be started at the rate of 100 tons per day with the completion of the new railroad.

WISCONSIN

Platteville District

HOMESTEAD—An additional 10-in. sheet of jack was struck in the west end workings, which assures a long run on the company's own land.

BLACK JACK (Galena)—This mine, recently acquired by the Mineral Point Zinc Co., has been unwatered and mining operations have been resumed.

ENTERPRISE—Rich jack borings were encountered on the Steinhoff property by H. E. Stephens and Charles Kistler who have taken over the Enterprise leases.

WILSON (Potosi)—The first carload of concentrates produced by this company at the Preston Point mine assayed 57% metallic zinc and brought $41.50 per ton.

CANADA

British Columbia

HAZELTON FREIGHT RATES on ore to the Trail smelter may be reduced, Canadian Pacific Ry. officials are negotiating with mine owners with a view to such reductions.

CORONATION (Lillooet)—The stamp-mill cleanup for the first 14 days of operation was valued at $22,000; 1680 tons of ore were milled and a recovery of 87% was effected equal to $13.10 per ton. All the ore treated was taken direct from the mine; many hundreds of tons are on the dump, ready for crushing.

TASSO (Judway, Queen Charlotte Isld.)—A. Jones, accompanied by a party of miners, left Queen Charlotte late in July for the west coast of Moresby Island to develop property of this company. Equipment and supplies were taken in and work will be pushed as rapidly as possible. As soon as plans and surveys can be completed, an aërial tramway will be built and bunkers built to facilitate shipments of ore.

BRITISH COLUMBIA COPPER CO. (Greenwood)—A small experimental mill is planned. It will be built at Boundary Falls to test ores from the Lone Star and Washington mines as well as from other properties now being developed. Should the experiments on Lone Star and Washington ores, which ores contain copper, some gold and little or no silver, prove successful, the capacity of the experimental unit would be increased to treat ore on a commercial scale.

Ontario

HUDSON BAY (Cobalt)—Another dividend of 300% has been declared.

HOLLINGER RESERVE (Timmins)—An examination of this property was recently made for the Lewisohns.

McINTYRE (Schumacker)—The shareholders have ratified the proposition to issue $250,000 in bonds to meet the expenses of development and finance the erection of a new mill.

MILLER LAKE-O'BRIEN (Gowganda)—A shipment of high-grade ore valued at $40,000 was shipped from Elk Lake recently, having been brought over the 27-mile wagon road in three hours by motor truck.

LUCKY CROSS (Swastika)—During a mill run of 12 days at the new 5-stamp mill, 430 tons of ore were treated, 252 oz. of bullion were produced and the tailings averaged $3.20 per ton, making the average value of the ore treated, $15 per ton.

CROWN RESERVE (Cobalt)—The directors declared, Aug. 11, that the monthly bonus of 3% hitherto paid along with the dividend of 2% would be dropped, the dividend being continued. The reason assigned was the pinching out of the Carson vein, the principal producer.

NIPISSING (Cobalt)—On Aug. 19, 212 bars of silver containing a total of 254,400 fine oz. were shipped to New York breaking all previous records for a single shipment. This was the result of seven days work at the high-grade mill. The ore came from a recent rich discovery on the 300-ft. level.

HOLLINGER (Timmins)—With the payment of the August dividend of $90,000, the company, since Aug. 1912, has paid out $990,000 to the shareholders. It is unofficially reported that the No. 1 vein has been intersected by the crosscut in the winze on the 425-ft. level. The vein is 10 ft. wide and $30 ore is found.

BEAVER—The station for the 800-ft. level is being cut, establishing a new low level for the Cobalt camp. Preparations are being made to crosscut east for the main or No. 5 vein. At 700 ft. the main vein shows a width of 4 in. of ore running between 3000 and 4000 oz. to the ton. A 2-in. stringer of high grade has been picked up at 460 and 530 ft.

MEXICO

Chihuahua

ALVARADO MINING & MILLING CO. (Parral)—Representatives of this company and of the Mines Company of America have brought out gold and silver bullion to the total value of $600,000 by wagon trains, to prevent its confiscation by Mexicans. The bullion was transported down the Conchos River valley and crossed into Texas at Presidio.

Sonora

EL TEMBLOR (Esqueda)—Another car of high-grade ore has been shipped to the Douglas smelter, this being the first consignment from the new vein, which ore assays 200 oz. silver and 2 oz. gold.

MONTE CRISTO (Moctezuma)—Carlos C. Soto has leased his properties including this mine to S. A. Gardanier who has started work and will employ about 50 men and ship the ore which is high grade to the Douglas smelters.

LUCKY TIGER (Yzabal)—In July 5119 tons of ore were crushed in the stamp mill, and in the cyanide plant 4767 tons of current and 1868 of dump tailings were treated. The total recovery is valued at $119,365, $42,395 being net profit.

GUERIGUITO (Cumpas)—W. C. Humphreys has a shipment at the Douglas smelter which will net him a good profit. As conditions are normal in this district a motor truck has been purchased for transporting supplies and ore between the mine and Nacozari.

LA UNION (Fronteras)—This mine, owned and operated by C. B. Bell, of Douglas, Ariz., is one of the most promising in Sonora. Recently nothing but development work has been attempted but 15 men have been employed. The vein is from 3 to 20 ft. wide and nearly a mile in length. The ore carries gold, silver and copper. One car was recently shipped to Douglas and 150 tons more are on the way.

SOUTH AMERICA

Chile

WITHDRAWAL OF IRON DEPOSITS from entry by private persons or corporations, in order to give the government time to select such iron properties as it may be thought best to hold, with a view to making them a source of revenue for the general government is the object of a bill now before the Chilean Congress.

Peru

HUANUCO GOLD FIELDS northeast of Cerro de Pasco have been examined by Carl Hand in the interests of the principal stockholders of the Cerro de Pasco Mining Co. Hand reports that the fields are a "no-pay proposition" and that the reports of gold-bearing gravel running £15 to £30 per yard was the result of a liberal salting of samples. The samples in question were sent through the mails from Ambo and were gravel contained in bags. The placers are along the banks and in the bed of the Huallaga River in the vicinity of Ambo, about 48 miles from Cerro de Pasco and the same distance from Goyllarisquisga. The proposed line of the Amazon Pacific Ry. would cut directly across the land included in the claims. Several thousand acres of land had been denounced by the various claimholders.

INDIA

Mysore

FIFTY MEN WERE KILLED in the Kolar gold field, Aug. 22, when a hoisting cable broke, dropping the cage to the bottom of the shaft. Further details have not yet been cabled.

THE MARKET REPORT

METAL MARKETS

The metal markets have been rather inclined to be quieter, but there has been no special weakness. It has been more a reaction from unusual activity than any decline.

Copper, Tin, Lead and Zinc

Copper—In the early part of the week just closing, the market was rather quiet and dull, the reaction from the period of large purchasing having continued. On Aug. 26 and 27, however, there was much more inquiry, especially from European sources, and sales improved with a slight advance in price. The larger agencies having their books pretty well filled for the present, made no attempt to press copper on the market, holding rather firmly to their price. The second hands and smaller sellers, however, made some concessions and secured the business which was going at lower terms. The close, however, is rather firm.

The Lake miners' strike continues and its close seems to be quite uncertain, although the Calumet & Hecla has succeeded in getting together a small part of its force and will have some men underground by the end of the week. Lake prices have been purely nominal. It is said that the chief producer is asking 16½c., but this price has not been paid for such small lots as have been sold during the week.

At the close, it looks as though the copper is second hands had been pretty well cleared up and the market is somewhat firmer, with electrolytic copper quoted at 15.50@15.60c., in cakes, wirebars or ingots. The market for Lake is unchanged and nominal at about 16c. per lb. Casting copper is quoted 15@15¼c., as an average for the week.

The London market for standard copper was sluggish on Aug. 21 and 22, but on Aug. 25 it advanced to £69 10s. for both spot and three months. Sentiment improved, with good buying, and on Aug. 26 the market advanced to £70 for spot and £69 18s. 9d., closing on Aug. 27 at £70 7s. 6d. for spot and £70 6s. 3d. for three months.

Base price of copper sheets is now 21c. for hot rolled and 22c. for cold rolled. Full extras are charged and higher prices for small quantities. Copper wire is 16¼@16½c., carload lots at mill.

Exports of copper from New York for the week were 7893 long tons. Our special correspondent gives the exports from Baltimore at 2670 tons for the week.

Tin—The market during the latter part of last week was almost stagnant. Local dealers tried to stimulate business in futures by undercutting London prices, without, however, arousing any interest. When the London market began its advance on Aug. 26, conditions in the domestic market changed entirely, and an active business among dealers and consumers developed. The market closes at a small decline from the top, which was reached on the morning exchange of Aug. 27, and the tone must be called steady at £192 10s. for spot and £191 12s. 6d. for three months, and about 42⅜c. for August tin here.

Lead—The market is firm at last prices: 4.75c., New York, and 4.70@4.75c., St. Louis. The Western market continues above the New York parity, on account of the scarcity of Missouri lead, due to the strike. The last advices, however, are that the strike is over and production will shortly be resumed.

The London market is firmer, good Spanish lead being quoted £20 10s.; English 7s. 6d. higher.

Spelter—The market is quiet but firm. St. Louis at the close is quoted 5.60@5.65c.; New York 5.75@5.80 cents.

The London market is firmer, good ordinaries being quoted £21 and specials £21 10s. per ton.

Base price of zinc sheets is now $7.75 per 100 lb., f.o.b. Peru, Ill., less 8% discount.

Other Metals

Aluminum—The market has been quiet, so far as spot sales are concerned, though there is something doing for future delivery. Domestic aluminum sells for 22@22½c. per lb. for No. 1 ingots. Foreign has been sold around 18¼c. in bond. The Tariff question is still unsettling the market.

Antimony—The market is dull and easy, and there is no change in prices. Cookson's is quoted at 8.35@8.40c. per lb.; Hallett's at 7.75@8c.; while 7.25@7.50c. is asked for Chinese, Hungarian and other outside brands.

Quicksilver—Business is fair and prices remain unchanged. New York quotations are $40 per flask of 75 lb., with 58@60c. per lb. asked for small lots. San Francisco, $39.50 for domestic orders, and $37 for copper. The London price is £7 5s. per flask, with £7 quoted from second hands.

Bismuth—Quotations at New York are $1.72 per lb. for metal produced from domestic ores; $1.80 for imported metal. London quotation is 7s. 6d. per lb. The price is controlled by the European syndicate.

Magnesium—Current price of pure metal is $1.50 per lb. for 100-lb. lots, New York.

Nickel—Quotations for ordinary forms, shot, blocks or plaquettes are 40@45c. per lb., according to size of order and quality. Electrolytic nickel is 5c. per lb. higher.

DAILY PRICES OF METALS

NEW YORK

Aug.	Sterling Exchange	Silver	Copper		Tin	Lead		Zinc	
			Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
21	4.8640	59¼	16	15.45 @15.55	41⅝	4.75	4.70 @4.75	5.70 @5.75	5.55 @5.60
22	4.8640	59¼	16	15.45 @15.55	41¼	4.75	4.70 @4.75	5.70 @5.75	5.55 @5.60
23	4.8620	59½	16	15.45 @15.55	41¼	4.75	4.70 @4.75	5.70 @5.75	5.55 @5.60
25	4.8625	59¼	16	15.45 @15.55	41⅜	4.75	4.70 @4.75	5.70 @5.75	5.55 @5.60
26	4.8625	59½	16	15.50 @15.60	42	4.75	4.70 @4.75	5.75 @5.80	5.60 @5.65
27	4.8615	59½	16	15.50 @15.60	42¼	4.75	4.70 @4.75	5.75 @5.80	5.60 @5.65

The quotations herein given are our appraisal of the market for copper, lead spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. We quote casting copper at 0.15c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

LONDON

Aug.	Silver	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
		Spot	3 Mos	Best Sel'td	Spot	3 Mos		
21	27 5/16	68 11/16	68 11/16	74¼	187¾	186½	20⅜	20½
22	27 5/16	68 5/16	68 5/16	73¾	187¼	186¼	20¼	20⅜
23	27 5/16	....	....	....	....	....	....	....
25	27 5/16	69½	69½	74¼	187¾	187	20⅜	20⅝
26	27 5/16	70	69 13/16	75¼	190	189¼	20½	20¾
27	27 5/16	70⅜	70 5/16	75½	192½	191⅝	20½	21

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c. = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

Exports of Metals and Minerals from Spain, five months ended May 31, reported by "Revista Minera," in metric tons:

Exports	Metals 1912	Metals 1913	Ores 1912	Ores 1913
Iron	25,013	4,943	3,465,357	4,117,181
Copper	9,297	11,465	72,787	73,565
Copper precipitate	5,608	2,350	.....	.....
Lead	76,524	91,544	1,571	742
Zinc	1,302	497	48,681	46,008
Quicksilver	1,472	1,042	.....	.....
Manganese	....	....	11,000	10,385
Pyrites	....	....	1,188,575	1,359,999

Pyritic ores carrying 2.5% or more in copper are classed as copper ores; below that they are included in pyrites. Exports of salt were 277,388 tons in 1912, and 289,018 tons in 1913; decrease, 11,630 tons.

Gold, Silver and Platinum

Gold has commanded no premium, the price on the open market in London remaining at 77s. 9d. per oz. for bars and 76s. 4d. per ton for bars and 70s. 4d. per oz. for American coin. There was no special demand. London is receiving a good deal of gold from South America.

Iridium—There is nothing new in this metal and the price remains high, $82@84 per oz. being asked by dealers.

Platinum—A good business has been done, but the market is unsettled for the first time in many months. Sales of refined platinum have been made as low as $43 per oz., and $43.50 is a general quotation. It looks as if some holders of stocks were tired of carrying them. The current quotation is below the cost of importing. For hard metal, $47@49 per oz. is quoted.

Silver—The tone of the market for the past week has been steady and well maintained at advancing prices, owing to buying by China and India. It closes steady at 27⅞d. in London.

Exports of silver from London to the East, Jan. 1 to Aug. 14, reported by Messrs. Pixley & Abell:

	1912	1913	Changes
India	£5,010,700	£4,393,500	D. £617,200
China	933,500	507,000	D. 426,500
Total	£5,944,200	£4,900,500	D. £1,043,700

Imports of silver at New York, week ended Aug. 23, were $64,385, chiefly from South America. Exports were $664,786, nearly all to London.

Gold and Silver Movement in the United States, seven months ended July 31:

	Gold 1912	Gold 1913	Silver 1912	Silver 1913
Exports	$40,661,500	$72,388,064	$40,260,276	$38,258,234
Imports	29,012,211	35,769,058	28,700,590	20,927,869
Excess, exp.	$11,649,289	$36,619,006	$11,559,686	$17,330,365

Exports of merchandise for the seven months were valued at $1,326,798,300; imports, $1,078,868,132; excess of exports, $307,930,168. Adding gold and silver makes the total export balance $161,879,539 for the seven months.

Zinc and Lead Ore Markets

PLATTEVILLE, WIS.—Aug. 23

The base priae paid this week for 60% zinc ore was $46@48 per ton. The base price paid for 80% lead ore was $54@55 per ton.

SHIPMENTS WEEK ENDED AUG. 23

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week	2,729,380	.....	981,300
Year to date	95,553,160	4,587,990	39,356,230

Shipped during week to separating plants 2,003,210 lb. zinc ore.

JOPLIN, MO.—Aug. 23

The high price of zinc blende is $52, the base per ton of 60% zinc from $48.50@49.50 for choice grades, and $47@48 base for blende carrying an excess of 8% of iron. Calamine sold on a base of $21@23 per ton of 40% zinc. The average of all grades is $45.28 per ton. Lead was advanced $3, selling on a base of $58 per ton of 80% metal contents with the average of all grades $57.76 per ton.

SHIPMENTS WEEK ENDED AUG. 23

	Blende	Calamine	Lead ore	Value
Totals this week	11,549,620	662,600	1,072,250	$307,555
Totals 34 weeks	365,952,510	26,550,650	59,976,320	$10,100,439

Blende value, the week, $267,603; 34 weeks, $8,181,864.
Calamine value, the week, $8975; 34 weeks, $337,521.
Lead value, the week, $30,977; 34 weeks, $1,581,054.

IRON TRADE REVIEW

NEW YORK—Aug. 27

The iron trade has a little firmer tone and business seems to be improving to a degree, though the buying movement expected in September has not yet set in.

More pig iron orders are being placed and prices are gradually firming up. No large advance is looked for, but concessions are no longer in order.

Exports and Imports of Iron and Steel and of manufactures thereof in the United States, six months ended June 30, are valued by the Department of Commerce and Labor, as below:

	1912	1913	Changes
Exports	$139,545,479	$155,498,537	I. $15,953,058
Imports	13,583,412	17,785,662	I. 4,202,250
Excess, exports	$125,962,067	$137,712,875	I. $11,750,808

Actual tonnage of iron and steel exports, so far as given in the reports was 1,423,022 tons in 1912 and 1,494,280 in 1913; increase, 71,258 tons. Imports 99,933 tons in 1912, and 164,804 in 1913; increase, 64,871 tons. Many important articles are given by values only.

PITTSBURGH—Aug. 26

The yielding in steel prices continues, the open quotation on plates having declined $1 a ton, while billets and sheet bars are obtainable $2 to $3 under quotations maintained until very recently. Galvanized sheets are slightly easier.

The flow of business in steel products continues to be confined to relatively small lots for early shipment. The aggregate is larger than in July, but is far below shipments and some mills are running out of orders to such an extent that they are quite eager for new business. This has resulted in price concessions already, and promises further declines before the mills fill up enough to lengthen the delivery period on new business.

The Steel Corporation has taken an order for 100,000 boxes of tinplate from the Standard Oil Co., for fourth-quarter delivery. The material is to be used in the export trade and the order was therefore taken in competition with the Welsh mills.

There is no material change in the rate at which the local steel mills are booking new business, the new orders, together with specifications on old contracts, amounting to perhaps 60% of the current shipments, which are maintained at practically full capacity.

Shading in plates and shapes began with the eastern mills almost two months ago. At first the Pittsburgh and more western mills maintained their prices, thus losing business in the East. Lately they have been meeting this competition, but have maintained prices for delivery outside of eastern territory. In the past week or 10 days several of the mills have dropped quotations $1 a ton on plates for delivery anywhere, making the market openly quotable at 1.40c., Pittsburgh. In structural shapes there has been some shading, but hardly a general decline.

A large steel interest just east of Pittsburgh is understood to have become much more aggressive for business, this having much to do with the weakening in plates and shapes, while this interest will likely also cut an important figure in the unfinished steel market.

The Carnegie Steel Company is now making openhearth steel at the Edgar Thomson plant—its great rail mill—for the first time. Of the 14 basic openhearth furnaces under construction for a year the first was fired Saturday week and the second last week, a third being scheduled for next week, while the whole plant, with a rated capacity of 600,000 to 700,000 tons of ingots annually, will be in operation by November. The Pittsburgh Crucible Steel Co. recently started its new plant of six open-hearth furnaces at Midland, Penn., while the Brier Hill Steel Co. will probably begin operating its new plant of eight furnaces, at Youngstown, in October.

Pig Iron—Last Friday morning the Carnegie Steel Co. purchased 10,000 tons of basic pig from the Pittsburgh Crucible Steel Co., for early delivery from Midland furnace, the price being on the basis of $14, Valley, or $14.90, Pittsburgh. The Steel Corporation is not particularly in need of pig iron. We quote: Bessemer, $15.75@16; basic, $14; No. 2 foundry, $14; malleable, $14.25; forge, $13.50, at Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—The market continues quiet. Consumers seem to be fairly well covered to the end of the year, and on any possible requirements are holding off on account

of the probability of removal of the duty. We continue to quote prompt at $55@56 and forward at $56, Baltimore.

Steel—Sales last week of two lots of sheet bars aggregating 3000 tons at only a trifle above $25, maker's mill, have been followed by still lower quotations. The large mills have not yet reduced quotations from their old level of $26.50 for billets and $27.50 for sheet bars, but admit that on the next sales they will have to do much lower. Meanwhile the market can be quoted roughly at $24.50 for billets and $25 for sheet bars.

IRON ORE

Imports and Exports of Iron Ore in the United States, six months ended June 30, long tons:

	1912	1913	Changes
Imports	994,376	1,136,153	I. 141,777
Exports	294,900	320,553	I. 25,653

Imports of manganese ore for the seven months were 104,432 tons in 1912, and 191,937 tons in 1913; increase, 87,505 tons.

British Imports of Iron Ore, seven months ended July 31, were 3,532,132 tons in 1912, and 4,717,936 in 1913; increase, 1,185,804 tons. Imports of manganese ore were 175,134 tons in 1912 and 379,774 in 1913; increase, 204,640 tons.

COKE

Connellsville Coke—Last Friday a sale of 2000 tons of prompt furnace coke was made at $2.50 and this week a fair tonnage was sold for prompt shipment at this figure, while at least one sale for the requirements of a furnace during September was made at the price. These sales indicate that the $2.50 price will be maintained for at least another month, despite the reported offering of coke early last week at lower figures.

Coal and Coke Tonnage, Pennsylvania R.R. Lines east of Pittsburgh and Erie, seven months ended July 31, short tons:

	1912	1913	Changes
Anthracite	5,525,010	6,138,175	I. 613,165
Bituminous	26,175,168	28,833,947	I.2,658,779
Coke	7,451,340	8,569,978	I.1,118,638
Total	39,151,518	43,542,100	I.4,390,582

The total increase this year was 11.2%. The largest comparative gain was in coke.

Exports and Imports of Fuel in the United States, six months ended June 30, are reported as follows, in long tons:

	Exports		Imports	
	1912	1913	1912	1913
Anthracite	1,131,247	2,067,873	30	31
Bituminous	6,358,765	7,029,958	754,705	721,619
Coke	404,069	480,982	41,627	33,680
Bunker coal	3,822,537	3,692,564	.....	.....
Totals	11,716,618	13,271,377	796,362	755,330

Increase in exports, 1,554,759 tons, or 13.3%; decrease in imports, 41,032 tons, or 5.2%. The bunker coal, or coal furnished to steamships in foreign trade, is practically all bituminous. The heaviest exports are to Canada, while that country also furnishes a large share of the imports. The imports are mainly on the Pacific Coast.

CHEMICALS

NEW YORK—Aug. 27

The general markets continue quiet with only a moderate amount of business forward. Not much change is expected before next month.

Imports and Exports of Chemicals and raw materials in the United States, six months ended June 30, were as follows:

	Imports		Exports	
	1912	1913	1912	1913
Arsenic, lb.	2,399,961	4,571,890	.....	.....
Copper sulphate, lb.	.....	.....	5,259,541	3,286,564
Bleach, lb.	35,460,695	36,501,674	400	8,460
Potash salts, lb.	317,549,481	293,063,479	1,659,059	6,058,324
Soda salts, lb.	5,996,283	6,762,729	249,395	179,472
Acetate of lime, lb.	.....	.....	36,584,105	40,095,980
Nitrate of soda, tons	255,428	378,261	5,120	3,280
Sulph. of ammonia, tons	22,373	24,594	60	.....
Phosphate, tons	.....	.....	585,788	652,161
Sulphur, tons	12,048	4,273	18,004	34,118
Pyrites, tons	472,522	472,853	.....	.....
Magnesite, tons	45,082	88,286	1,217	2,067
Chrome ore, tons	31,564	27,409	.....	.....

Exports include reëxports of foreign material. Some phosphate rock is imported, but is not given separately in the trade returns.

Arsenic—The market is dull and demand small. Nothing is coming from Mexico, but the American smelters can easily take care of all that is required just now. Prices are $3@3.25 per 100 lb. and are rather nominal.

Copper Sulphate—Trade has been improving and is now on a very fair scale. Prices are unchanged at $5 per 100 lb. for carload lots and $5.25 per 100 lb. for smaller parcels.

Nitrate of Soda—The market has been dull during the week. Quotations are unchanged at 2.32½c. per lb. for spot and September; 2.35c. for September-December, and 2.40c. for 1914 deliveries.

COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

	March	April	May	June	July
Alaska shipments	472,293	1,730,252	1,771,508	2,203,191	2,705,136
Anaconda	22,900,000	23,800,000	25,600,000	21,500,000	22,100,000
Arizona, Ltd.	3,200,000	3,100,000	3,200,000	3,000,000	2,600,000
Copper Queen	7,558,709	8,210,166	8,301,605	7,477,936	8,369,607
Calumet & Ariz.	4,250,000	4,500,000	4,300,000	4,000,000	3,800,000
Chino	4,464,723	3,925,409	3,883,611	3,682,706	4,686,250
Detroit	1,640,671	1,856,517	2,001,633	1,750,601	1,519,224
East Butte	1,400,000	1,400,000	1,268,595	1,055,646	.....
Mammoth	1,641,091	1,450,000	1,700,000	1,750,000	1,800,000
Giroux*	625,000	600,000	625,000	610,000	.....
Mason Valley	1,608,492	1,264,304	1,186,560	1,097,014	908,892
Miami	.....	.....	1,943,900	2,612,000	.....
Nevada Con.	5,555,320	5,650,000	5,933,275	6,344,863	5,403,919
Ohio	591,651	690,001	650,071	537,400	.....
Old Dominion	2,853,000	3,040,000	2,749,000	2,511,000	2,526,000
Ray	4,287,000	4,379,128	4,384,400	4,392,612	.....
Shannon	1,260,000	1,238,000	1,080,000	924,000	880,000
South Utah	62,224	132,267	200,000	185,000	140,000
Tennessee	1,796,394	1,718,188	§1,037,115	1,379,220	1,247,804
United Verde*	3,000,000	3,000,000	3,000,000	2,900,000	.....
Utah Copper Co.	8,248,880	9,539,847	10,003,227	11,637,949	9,849,043
Lake Superior*	19,000,000	17,000,000	18,705,000	16,500,000	17,500,000
Non-rep. mines*	6,203,606	6,000,000	6,300,000	6,000,000	6,200,000
Total prod.	102,619,054	104,224,079	109,824,500	104,006,138	.....
Imports, bars, etc.	24,215,480	25,578,297	22,205,942	18,255,267	.....
Total blister.	126,834,534	129,802,376	132,030,442	122,261,465	.....
Imp. ore & matte	11,911,041	7,177,363	10,528,562	7,497,002	.....
Total Amer.	138,745,575	136,979,739	142,559,004	129,758,407	.....
Miami†	3,102,200	2,312,900	.....	.....	2,890,000
Shattuck-Arizona	1,234,450	1,158,326	1,026,170	1,059,625	1,019,388
Brit. Col. Cos:					
British Col. Cop.	844,735	794,000	.....	.....	.....
Granby	1,967,962	1,857,452	1,782,570	1,789,000	.....
Mexican Cos.:					
Boleo†	2,204,720	2,811,200	2,424,800	1,984,640	2,240,720
Cananea	4,772,000	3,581,690	2,272,000	2,908,000	3,328,000
Moctezuma	3,062,159	2,753,240	2,695,881	3,438,793	2,693,006
Other Foreign:					
Braden, Chile	1,472,000	1,512,000	1,150,000	1,804,000	1,046,000
Cape Cop., S. Af.	732,480	586,880	387,520	414,400	.....
Kyshtim, Russia	1,478,400	2,544,640	1,490,000	.....	.....
Spassky, Russia	974,400	974,400	721,280	835,520	.....
Exports from					
Chile	7,840,000	7,616,000	3,584,000	5,824,000	9,856,000
Australia	6,944,000	6,608,000	7,840,000	7,616,000	10,304,000
Arrivals—Europe†	15,585,920	10,545,920	13,661,760	5,277,440	11,728,640

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines. From July 1 Miami ore went back to Cananea.

† Does not include the arrivals from the United States, Australia or Chile.

§ In operation only 20 days in May.

STATISTICS OF COPPER

	United States			Visible Stocks.		
Month	U.S.Refin'y Production	Deliveries, Domestic	Deliveries, for Export	United States	Europe	Total
VII, '12	137,161,129	71,094,381	60,121,331	44,335,004	108,186,000	152,521,003
VIII.	145,628,521	78,722,418	70,485,150	50,280,421	113,299,200	163,579,621
IX.	140,089,819	63,460,810	60,264,796	46,701,374	113,568,000	160,269,374
X.	145,405,453	84,104,734	47,621,342	63,065,587	107,408,000	170,473,587
XI.	134,695,400	69,369,795	55,906,550	76,744,964	103,801,600	180,546,564
XII.	143,354,042	58,491,723	65,713,796	86,164,059	96,947,200	183,111,259
Year, 1912	1,581,920,287	819,665,948	746,396,452	.....	.....	.....
I. 1913.	143,479,625	65,210,030	60,383,845	105,312,582	78,491,840	183,904,422
II.	130,948,881	59,676,492	72,168,523	123,198,332	77,504,000	200,702,332
III.	136,251,849	76,585,471	77,699,306	122,302,890	81,244,800	203,547,690
IV.	135,353,402	78,158,837	85,894,727	104,269,270	87,180,800	191,450,070
V.	141,319,416	81,108,321	68,285,978	75,549,108	85,948,800	161,497,908
VI.	121,860,853	68,362,571	68,067,901	67,474,225	77,235,200	144,709,425
VII.	138,074,602	58,904,192	78,480,071	52,814,606	71,904,000	124,808,606
VIII.	.....	.....	.....	53,594,945	66,420,480	120,015,385

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

Assessments

Company	Delinq.	Sale	Amt.
Caledonia, Nev.	Aug. 14	Sept. 12	$0.025
Central Eureka, Calif.	Aug. 14	Sept. 14	0.025
Columbus Ext., Utah	Aug. 15	Sept. 5	0.02
Con. Imperial, Nev.	Aug. 28	Sept. 19	0.01
Dalmatia, Ida.	Aug. 5	Sept. 3	0.002
Emerald, Utah (2d install.).	..	Sept. 13	0.005
Empire, Ida.	Aug. 12	Sept. 12	0.002
Eureka, Ida.	Aug. 11	Sept. 11	0.001
Exchequer, Nev.	Aug. 28	Sept. 17	0.02
Florence	Aug. 16	Sept. 16	0.001
Hamburg-American, Ida.	Sept. 8	Sept. 29	0.000¾
Hypotheek, Ida.	Aug. 15	Sept. 9	0.003
Iron Spar, Ida.	Aug. 16	Sept. 13	0.0025
Keystone, Utah.	Aug. 2	Sept. 2	0.01
Laclede, Ida.	Aug. 16	Sept. 4	0.003
Lake Copper, Mich.	.....	Sept. 9	2.00
Lucky Calumet, Ida.	Aug. 11	Sept. 10	0.005
Morgan Argentine, Utah.	Sept. 1	Sept. 16	0.005
Morning Star, Utah.	Aug. 8	Sept. 1	0.0025
New Hope, Ida.	Aug. 19	Sept. 19	0.002
Potosi, Nev.	Sept. 4	Sept. 26	0.02
Snowshoe, Ida.	July 2	Sept. 2	0.005
Sonora, Ida.	Aug. 30	Sept. 16	0.002
Sunset, Ida.	Aug. 15	Sept. 6	0.0015
Sunshine, Ida.	July 1	Oct. 15	0.001
Utah Nev.	Aug. 16	Sept. 6	0.02
Yellow Jacket, Nev.	.....	.....	0.10

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1911	1912	1913	1911	1912	1913
January	53.795	56.260	62.938	24.865	25.887	28.983
February	52.222	59.043	61.642	24.081	27.190	28.357
March	52.745	58.375	57.870	24.324	26.875	26.669
April	53.325	59.207	59.490	24.595	27.284	27.416
May	53.308	60.880	60.361	24.583	28.038	27.825
June	53.043	61.290	58.990	24.486	28.215	27.199
July	52.630	60.654	58.721	24.286	27.919	27.074
August	52.171	61.606	.....	24.082	28.375	.....
September	52.440	63.078	.....	24.209	29.088	.....
October	53.340	63.471	.....	24.594	29.299	.....
November	55.719	62.792	.....	25.649	29.012	.....
December	54.905	63.365	.....	25.349	29.320	.....
Year	53.304	60.835	.....	24.592	28.042	.....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

Month	New York				London, Standard	
	Electrolytic		Lake			
	1912	1913	1912	1913	1912	1913
January	14.094	16.488	14.337	16.767	62.760	71.741
February	14.084	14.971	14.329	15.253	62.893	65.519
March	14.698	14.713	14.868	14.930	65.884	65.329
April	15.741	15.291	15.930	15.565	70.294	68.111
May	16.031	15.436	16.245	15.738	72.352	68.807
June	17.234	14.672	17.443	14.871	78.259	67.140
July	17.190	14.190	17.353	14.563	76.636	64.166
August	17.498	.....	17.644	.....	78 670	.....
September	17.508	.....	17.698	.....	78.762	.....
October	17.314	.....	17.661	.....	76.389	.....
November	17.326	.....	17.617	.....	76.890	.....
December	17.376	.....	17.600	.....	75.516	.....
Year	16.341	.....	16.560	.....	72.942	.....

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN

Month	New York		London	
	1912	1913	1912	1913
January	42.529	50.298	191.519	238.273
February	42.962	48.766	195.036	220.150
March	42.577	46.832	192.619	213.645
April	43.923	49.115	200.513	224.119
May	46.063	49.038	208.830	224.143
June	45.815	44.820	205.863	207.208
July	44.519	40.260	202.446	183.511
August	45.857	.....	208.351	.....
September	49.135	.....	223.762	.....
October	50.077	.....	228.353	.....
November	49.891	.....	227.619	.....
December	49.815	.....	226.875	.....
Av. year	46.096	.....	209.322	.....

New York in cents per pound; London in pounds sterling per long ton.

LEAD

Month	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	4.435	4.321	4.327	4.171	15.597	17.114
February	4.026	4.325	3.946	4.175	15.738	16.550
March	4.073	4.327	4.046	4.177	15.997	15.977
April	4.200	4.381	4.118	4.242	16.331	17.597
May	4.194	4.342	4.072	4.226	16.509	18.923
June	4.392	4.325	4.321	4.190	17.588	20.226
July	4.720	4.353	4.603	4.223	18.544	20.038
August	4.569	.....	4.452	.....	19.655	.....
September	5.048	.....	4.924	.....	22.292	.....
October	5.071	.....	4.894	.....	20.630	.....
November	4.615	.....	4.463	.....	18.193	.....
December	4.303	.....	4.152	.....	18.069	.....
Year	4.471	.....	4.360	.....	17.929	.....

New York and St. Louis cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	6.442	6.931	6.292	6.854	26.642	26.114
February	6.499	6.239	6.349	6.089	26.661	25.338
March	6.626	6.078	6.476	5.926	26.048	24.605
April	6.633	5.641	6.483	5.491	25.644	25.313
May	6.679	5.406	6.529	5.256	25.790	24.583
June	6.877	5.124	6.727	4.974	25.763	22.143
July	7.116	5.278	6.966	5.128	26.174	20.592
August	7.028	.....	6.878	.....	26.443	.....
September	7.454	.....	7.313	.....	27.048	.....
October	7.426	.....	7.276	.....	27.543	.....
November	7.371	.....	7.221	.....	26.804	.....
December	7.162	.....	7.081	.....	26.494	.....
Year	6.943	.....	6.799	.....	26.421	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON IN PITTSBURG

Month	Bessemer		Basic		No. 2 Foundry	
	1912	1913	1912	1913	1912	1913
January	$15.12	$18.15	$13.32	$17.35	$14.00	$18.59
February	15.03	18.15	13.28	17.22	14.01	18.13
March	14.95	18.15	13.66	16.96	14.10	17.53
April	15.13	17.90	13.90	16.71	14.15	16.40
May	15.14	17.68	13.90	15.80	14.12	15.40
June	15.15	17.14	14.11	15.40	14.22	15.10
July	15.15	16.31	14.38	15.13	14.38	14.74
August	15.43	.....	14.90	.....	14.85	.....
September	16.86	.....	16.03	.....	15.63	.....
October	17.90	.....	17.18	.....	17.22	.....
November	18.07	.....	17.09	.....	18.00	.....
December	18.15	.....	17.45	.....	18.73	.....
Year	$16.01	.....	$14.93	.....	$15.28	.....

STOCK QUOTATIONS

COLO. SPRINGS Aug. 26

Name of Comp.	Bid.
Acacia	.02⅜
Cripple Cr'k Con.	.01
C. K. & N.	.12
Doctor Jack Pot	.05½
Elkton Con.	.56
El Paso	3.17
Findlay	.02
Gold Dollar	.06¾
Gold Sovereign	.02½
Isabella	.10½
Jack Pot	.04¼
Jennie Sample	.06
Lexington	‡.005
Moon Anchor	‡.01
Old Gold	.06¾
Mary McKinney	.60½
Pharmacist	.01½
Portland	.95
Vindicator	.85
Work	‡.005

SALT LAKE Aug. 26

Name of Comp.	Bid.
Beck Tunnel	.05½
Black Jack	.07
Cedar Talisman	.00½
Colorado Mining	.13
Columbus Con.	‡.02
Crown Point	.01½
Daly-Judge	6.20
Grand Central	.50
Iron Blossom	1.20
Little Bell	.10
Lower Mammoth	.01¼
Mason Valley	6.25
May Day	.06
Nevada Hills	.75
New York	.02
Prince Con	.35
Silver King Coal'n	3.00
Sioux Con.	.02½
Uncle Sam	.04
Yankee	‡.08

TORONTO Aug. 25

Name of Comp.	Bid	Name of Comp.	Bid
Bailey	.06	Foley O'Brien	.15
Coniagas	7.00	Hollinger	14.75
T. & Hudson Bay.	70.00	Imperial	.01
Timiskaming	.25	Jupiter	.25
Wettlaufer-Lor	.12	Pearl Lake	.28
Apex	.01	Porcu. Gold	.07
Crown Chartered	.00⅜	Preston E. D.	.01
Dobie	.10	Rea	.12
Dome	13.00	Swastika	.04
Dome Exten.	.07	West Dome	.10

SAN FRANCISCO Aug. 26

Name of Comp.	Bid	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.05	Belmont	7.00
Belcher	.20	Jim Butler	.61
Best & Belcher	.06	MacNamara	11
Caledonia	1.27½	Midway	.46
Challenge Con	.07	Mont.-Tonopah	1.10
Chollar	.01	North Star	.78
Confidence	.14	West End Con.	1.25
Con. Virginia	.10	Atlanta	.14
Crown Point	.20	Booth	.01
Gould & Curry	.03	C.O.D. Con	.03
Hale & Norcross	.07	Comb. Frac	.05
Mexican	1.07	Jumbo Extension	.12
Occidental	.70	Pitts.-Silver Peak	.45
Ophir	.23	Round Mountain	.48
Overman	‡.45	Silver Pick	.03
Potosi	.01	Tramp Con	‡.01
Savage	.11	Argonaut	2.25
Sierra Nevada	.05	Bunker Hill	1.50
Union Con	.11	Central Eureka	.12
Yellow Jacket	.14	So. Eureka	‡2.62

N. Y. EXCH. Aug. 26

Name of Comp.	Clg.
Amalgamated	73⅛
Am. Agri. Chem.	44⅛
Am.Sm.&Ref.,com	67⅛
Am. Sm. & Ref., pf.	100
Am. Sm. Sec., pf. B	81
Anaconda	36⅛
Batopilas Min.	1¼
BethlehemSteelpf	72
Chino	40
Federal M. & S., pf.	37
GreatNor.,ore,ctf.	34⅛
Guggen. Exp.	46
Homestake	107
Inspiration Con.	15¼
Miami Copper	23
Nat'nalLead,com.	48
National Lead, pf.	105⅛
Nev. Consol.	16
Phelps Dodge	192⅛
Pittsburg Coal, pf.	83
Quicksilver, pf.	3⅝
Ray Con.	19⅛
RepublicI&S,com.	23½
Republic I & S, pf.	88½
SlossSheffi'd,com.	30
Sloss Sheffield, pf.	86
Tennessee Copper	31¼
Utah Copper	51⅛
U. S. Steel, com.	63⅛
U. S. Steel, pf.	108
Va.Car. Chem., pf.	99

N. Y. CURB Aug. 26

Name of Comp.	Clg.
Barnes King	1⅜
Beaver Con.	.26
Big Four	.33
Braden Copper	6¾
B. C. Copper	2¼
Buffalo Mines	2⅝
Can. G. & S.	.23
Con. Ariz. Sm.	⅛
Davis-Daly	1⅞
Diam'field-Daisy	.02
Ely Con.	.07⅜
Florence	.23
Giroux	1⅝
Gold Hill Con.	‡¼
Goldfield Con.	1⅛
Greene Cananea	33
Greenwater	.04
Internat. S. & R.	‡115
Kerr Lake	3½
Keystone	‡2
La Rose	2⅝
McKinley-Dar-Sa.	1⅜
Min. Co. of A. new	2¼
Motherlode Gold.	‡.60
Nipissing Mines	8⅞
Ohio Copper	⅜
Pacific Sm. & M.	⅛
Puebla S. & R.	2
South Live Oak	‡2
South Utah M. & S.	¼
Stand'd Oil of N.J.	373
Stewart	1¼
Tonopah	4⅜
Tonopah Ex.	2
Tonopah Merger	.73
Tri-Bullion	⅛
Tularosa	⅜
Union Mines	⅛
United Cop., pfd.	2½
Yukon Gold	2

LONDON Aug. 16

Name of Com.	Clg.
Camp Bird	£0 15s 9d
El Oro	0 15 0
Esperanza	1 2 6
Mexico Mines	5 7 6
Oroville	0 5 9
Santa Gert'dis	1 1 3
Stratton's	0 1 9
Temboy	1 6 3

BOSTON EXCH. Aug. 26

Name of Comp.	Clg.
Adventure	1¾
Ahmeek	275
Alaska Gold M.	183⅛
Algomah	1⅛
Allouez	36
Am. Zinc	203⅛
Ariz. Com., ctfs.	2⅞
Bonanza	.32
Boston & Corbin	.95
Butte & Balak	2
Calumet & Ariz.	62
Calumet & Hecla	415
Centennial	13¾
Cliff	1⅜
Copper Range	39⅜
Daly West	2¾
East Butte	11⅜
Franklin	4½
Granby	62¼
Hancock	17¼
Hedley Gold	30
Helvetia	¼
Indiana	5½
Island Cr'k, com.	51
Island Cr'k, pfd.	83½
Isle Royale	18¾
Keweenaw	1⅛
Lake	6½
La Salle	3¾
Mass	2¾
Michigan	1
Mohawk	43
New Arcadian	1½
New Idria Quick	‡17⅞
North Butte	27¼
North Lake	1½
Ojibway	.99
Old Dominion	49
Osceola	79
Quincy	60
Shannon	6½
Shattuck-Ariz.	25¼
Superior	24⅜
Superior & Bost.	2⅜
Tamarack	26½
Trinity	4¼
Tuolumne	76
U. S. Smelting	36
U. S. Smelt'g, pf.	47¼
Utah Apex	1¾
Utah Con.	9
Victoria	1
Winona	1½
Wolverine	44½
Wyandot	¾

BOSTON CURB Aug. 26

Name of Comp.	Bid
Bingham Mines	4
Boston Ely	⅛
Butte & Lon'nDev.	.37
Butte Central	.05
Cactus	.02
Calaveras	2
Chief Cons	1⅜
Corbin	.99
Cortez	.15
Crown Reserve	1⅛
Eagle & Blue Bell	.95
First Nat. Cop.	2⅜
Houghton Copper	3½
Majestic	.32
Mexican Metals	.28
Moneta Porc.	‡.07
Nevada-Douglas	2
New Baltic	.60
Oneco	.80
Raven Copper	.13
Rhode Island Coal	.01
Smokey Dev.	1
S. W. Miami	2½
South Lake	4
Trethewey	¼
United Verde Ext.	.55

‡Last quotation.